# THE
# GREAT LAKES AND ST LAWRENCE
# SEAWAY SYSTEM
# COMMERCIAL ATTRACTIVENESS
# AND
# PRIORITIES FOR POLICY DEVELOPMENT

by

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THE RESEARCH AND TRAFFIC GROUP

# TABLE OF CONTENTS

**INTRODUCTION** .... 1

**SUMMARY OF CONCLUSIONS and PRIORITIES FOR POLICY DEVELOPMENT** .... 3

Commerce Through the Great Lakes and St. Lawrence .... 3
- GRAIN .... 5
- IRON ORE .... 5
- COAL .... 5
- POTASH .... 5
- GENERAL CARGO AND STEEL .... 6
- FORECASTING FUTURE TRAFFIC .... 6
- IMPORTANCE TO ONTARIO .... 7

Transport Cost and System Competitiveness .... 8
- THE MISSISSIPPI .... 8
- EXPORT GRAIN THROUGH THE WEST COAST .... 10
- DIRECT RAIL TO THE LOWER ST LAWRENCE .... 12
  - Canadian Grain .... 13
  - Iron Ore .... 14
  - Potash .... 14
  - Coal .... 15
- LOWER BUILDING, CREW AND TAXES COST .... 16
- GREAT LAKES BULKER FLEET .... 17
- TRUCKING .... 17

Selected Concerns and Opportunities .... 18
- TECHNOLOGY AND OPERATIONS INNOVATION .... 18
- SEASON EXTENSION .... 19
- OVERSEAS GENERAL CARGO AND PORT MARKETING .... 20
- CROSS LAKE SERVICE .... 21

Infrastructure Costs, Financing and Administration .... 21
- INDUSTRY IMPACT AND EFFICIENT COST RECOVERY .... 22
- ADMINISTRATIVE STRUCTURE .... 23
- PORTS .... 24

Priority Policy Study .... 25
- ONTARIO'S PERSPECTIVE ON THE EMERGING *WESTERN GRAIN TRANSPORTATION ACT* DEBATE .... 25
- INTRODUCTION OF FOREIGN BUILT VESSELS/FLAG OPERATION INTO GREAT LAKES BULKER SERVICE .... 26
- INFRASTRUCTURE ADMINISTRATION AND PORTS RATIONALIZATION .... 26

CHAPTER 1: COMMERCE THROUGH THE GREAT LAKES/ST LAWRENCE . . . . . . . . 27

Description . . . . . . . . 28
  TRAFFIC COMPOSITION . . . . . . . . 30

Traffic On the St. Lawrence Seaway . . . . . . . . 31
  GRAIN . . . . . . . . 34
  CANADIAN GRAIN . . . . . . . . 36
  U.S. GRAIN . . . . . . . . 40
  IRON ORE . . . . . . . . 43
  COAL . . . . . . . . 47
  POTASH . . . . . . . . 49
  LIQUID BULK . . . . . . . . 49
    Petroleum Products . . . . . . . . 50
    Inorganic Chemicals . . . . . . . . 51
    Edible Oils . . . . . . . . 51
  IRON AND STEEL PRODUCTS . . . . . . . . 52
  OTHER TRAFFIC . . . . . . . . 54
    Construction Materials . . . . . . . . 55
    Salt . . . . . . . . 55
    Forest Products . . . . . . . . 56

Review of Forecasting . . . . . . . . 57

Importance to Ontario . . . . . . . . 58
  GRAIN HANDLING . . . . . . . . 58
  STEEL . . . . . . . . 59
  AGGREGATE . . . . . . . . 60

CHAPTER 2: CANADIAN GREAT LAKES SHIPPING MAJOR BULK PRODUCTS COST & SYSTEM COMPETITIVENESS . . . . . . . . 61

Methodology . . . . . . . . 61
    Costing . . . . . . . . 62
    Rates . . . . . . . . 63
    Competing Routes and Modes . . . . . . . . 63

General Findings and Conclusions . . . . . . . . 64

The Mississippi River System . . . . . . . . 68
  CANADIAN GRAIN . . . . . . . . 69
  POTASH . . . . . . . . 73

West Coast Ports: Grain . . . . . . . . 75
  GREAT/LAKES ST LAWRENCE ROUTING COST . . . . . . . . 77

Western Grain Transportation Act . . . . . . . . . . . . . . . . . . . . . . 77
Great Lakes Rates . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 80
Elevation Charges . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 81
MARKET SHIFT . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 82
URGENCY . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 83
GREAT LAKES BULKER FLEET . . . . . . . . . . . . . . . . . . . . . . . . . 83

Direct Rail VS Great Lakes and St Lawrence . . . . . . . . . . . . . . . . . 85
RAIL RATES . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 85
CANADIAN EAST COAST PORTS . . . . . . . . . . . . . . . . . . . . . . . . 88
UNITED STATES PORTS . . . . . . . . . . . . . . . . . . . . . . . . . . . . 89
CANADIAN GRAIN . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 89
At and East Grain . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 90
Rail Running Through Thunder Bay . . . . . . . . . . . . . . . . . . . . . . 91
IRON ORE . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 95
Seaway Shuttle . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 96
Ship/Rail . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 96
POTASH . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 97
COAL . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 99
Ontario Hydro . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 100
Steel Industry . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 101
Trucking . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 103

Lower Building, Crew and Taxes Cost . . . . . . . . . . . . . . . . . . . . . 105
Cost Savings . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 106
Industry Impact . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 108
Policy Considerations . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 109

**CHAPTER 3: CANDIDATE OPPORTUNITIES INVESTIGATED** . . . . . 111

Technology and Operations Innovation . . . . . . . . . . . . . . . . . . . . 112
TECHNOLOGY AND OPERATIONS PROSPECTS . . . . . . . . . . . . . . . 113
Technology . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 113
Operations Methods . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 116
POTENTIAL VOYAGE COST SAVINGS . . . . . . . . . . . . . . . . . . . . 117
Season Extension . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 121
GENERAL . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 122
ATTRACTIONS AND AVERSIONS . . . . . . . . . . . . . . . . . . . . . . . 122
FEASIBILITY AND SYSTEM COSTS . . . . . . . . . . . . . . . . . . . . . . 123
CARRIER COSTS IMPLICATIONS . . . . . . . . . . . . . . . . . . . . . . . 124
VALUE OF ALL YEAR SERVICE . . . . . . . . . . . . . . . . . . . . . . . . 126
Bulk Traffic . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 126
Container . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 127
Non Containerized General Cargo . . . . . . . . . . . . . . . . . . . . . . 128
Carrier Considerations . . . . . . . . . . . . . . . . . . . . . . . . . . . . 128
RELEVANT ISSUES FOR SPECIAL CONSIDERATION . . . . . . . . . . . . 129

Overseas General Cargo and Port Marketing . . . . . . . . . . . . . . . . . 130

GENERAL . . . . . 131
CONTAINER SERVICES INTO THE LAKES . . . . . 131
FEEDER SERVICE TO MONTREAL OR HALIFAX . . . . . 132
GENERAL CARGO (CONTAINER) MARKETING . . . . . 133

Cross Lake Operations Barge and Ro-Ro . . . . . 139
BACKGROUND . . . . . 140
ECONOMIC FEASIBILITY EXPLORATION . . . . . 142
Design Concept . . . . . 143
Barges . . . . . 144
Barge and Ro-Ro Comparisons . . . . . 145
Preliminary Operations Cost Estimates . . . . . 146
Terminals Capital Costs . . . . . 147
PROSPECTS . . . . . 150

**CHAPTER 4 REVIEW OF SELECTED LEGISLATION** . . . . . 153

COASTING TRADE . . . . . 154
WESTERN GRAIN TRANSPORTATION ACT . . . . . 156
AT AND EAST RATES ON FLOUR AND GRAIN . . . . . 159
ATLANTIC REGION FREIGHT ASSISTANCE PROGRAM . . . . . 161

**CHAPTER 5 INFRASTRUCTURE COSTS, FINANCING AND ADMINISTRATION** . . . . . 163

Great Lakes/St Lawrence System Infrastructure Costs . . . . . 164
ST. LAWRENCE SEAWAY . . . . . 165
PILOTAGE AUTHORITIES . . . . . 167
CANADIAN COAST GUARD . . . . . 168

Cost Recovery Implications . . . . . 172
OPERATING COST IMPACT . . . . . 174
INFRASTRUCTURE CAPITAL CHARGES . . . . . 177

Cost Recovery: Flaws, Theory and Practice . . . . . 178

Ports . . . . . 181

Administration . . . . . 184
STABILITY . . . . . 185
RECOVERY MECHANISM . . . . . 186
PRICING STRUCTURE AND INSTITUTIONAL FRAMEWORK . . . . . 189
MANAGEMENT STRUCTURE . . . . . 190

APPENDIX A: Commerce Through The Great Lakes/St. Lawrence . . . . . . . . . . . 193

APPENDIX B: Forecasting St Lawrence Seaway Traffic . . . . . . . . . . . . . . . . . . 243

APPENDIX C: An Opaque Market Regulatory Evolution . . . . . . . . . . . . . . . . . . 249

APPENDIX D: Vessel Costing Model Economies from Foreign Built Vessels . . . . 251

APPENDIX E: Data Used for Unit Cost Sensitivity . . . . . . . . . . . . . . . . . . . . . . 259

APPENDIX F: Cross Lake Service; University of Pennsylvania Study . . . . . . . . . 263

APPENDIX G: Canadian Coast Guard Attribution To Central Region . . . . . . . . . . 267

# INTRODUCTION

This study into the Great Lakes/St. Lawrence Seaway System was commissioned by the Marine Office of the Ontario Ministry of Transportation. The purpose of the study was to provide advice regarding "... administrative, financial and management issues affecting the Great Lakes and St. Lawrence Seaway."

Principal authors of the report are David Hackston and Richard Lake, Partners in the Research and Traffic Group. Major contributions were made by Hazem Ghonima of TAF Consulting, Ross Jacobs of the Research and Traffic Group, and Doug Masson of J.D. Masson Consulting.

The consultants were fortunate to receive advice and counsel from Roger Madill and Andrew Kibedi of the Marine Office. Their assistance was invaluable.

A crucial element of the study was a *round table* group session with senior government, carrier, port and shipper officials, held over two days a the Guild Inn in Scarborough. This group, during and subsequent to the meeting had an important impact on the conclusions and, in particular, the emphasis of this report. Participating, in addition to the above, were:

| | |
|---|---|
| David Gardiner | President, Misener Shipping |
| Robert Hennessy | Port Director, Hamilton Harbour Commission |
| Gilbert Mackie | Vice President, Marketing and Sales, CP Rail |
| Duncan Maxwell | President, Upper Lakes Shipping |
| Norman Mealing | Executive Director, Provincial Transportation, Ontario Ministry of Transportation |
| Keith Oglesby | Director Planning, St Lawrence Seaway Authority |
| Andre Pageot | Director General, Marine Policy, Transport Canada |
| William Sheffield | Director, Transportation, Abitibi-Price. |

A great number of individuals and organizations, contacted during the conduct of the study but too many to name here, also made substantive contributions.

Notwithstanding the importance of the contributions of others, the report and its contents are the sole responsibility of Richard Lake and David Hackston, and do not necessarily reflect either the policy of the Government of Ontario or the views of any of its officials.

The study documented in this report was general in nature and broad in scope. It was intended to provide background research for focused policy studies. Emphasis was on the identification of concerns and opportunities, rather than on their exploration. The primary thrust of cost and other analysis is on the long term. In the course of illuminating certain existing and potential problems, this report may also accentuate them when more thorough study would conclude with constructive suggestions for their resolution. A pessimistic approach to the future of the Great Lakes/St Lawrence and the Canadian shipping industry that operates there is not intended and probably not warranted. It is merely the incidental consequence of a problem identification focus.

This introduction is followed by a brief summary of conclusions and implied priorities for policy development. These are taken from the more substantive discussion, which is organized into five chapters:

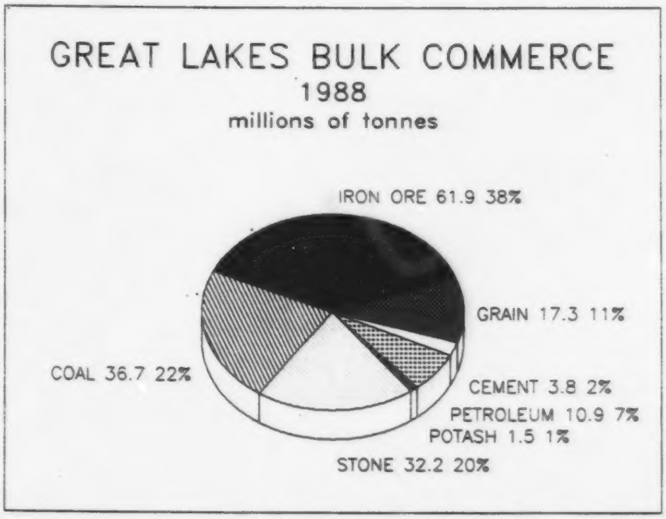
*COMMERCE THROUGH THE GREAT LAKES/ST LAWRENCE*
*CANADIAN GREAT LAKES SHIPPING: MAJOR BULK PRODUCTS COST & SYSTEM COMPETITIVENESS*
*CANDIDATE OPPORTUNITIES INVESTIGATED*
*REVIEW OF SELECTED LEGISLATION*
*INFRASTRUCTURE COSTS, FINANCING AND ADMINISTRATION*

For more detailed analysis the reader is referred to the supporting Appendices.

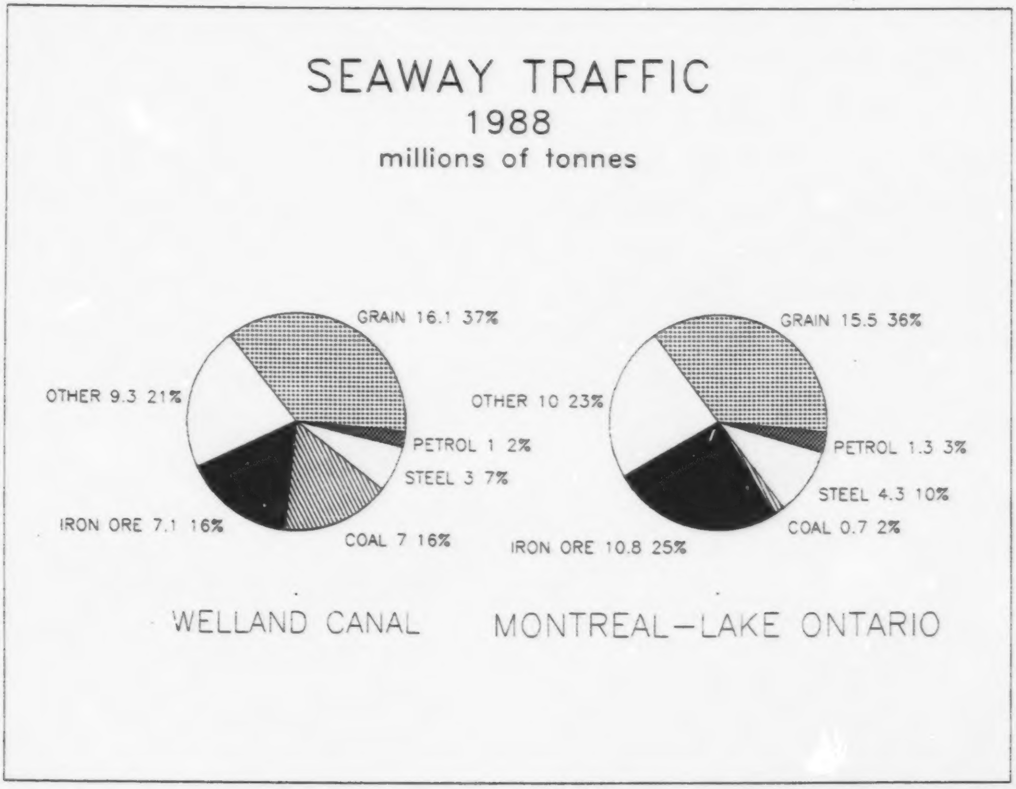
# SUMMARY OF CONCLUSIONS
# and
# PRIORITIES FOR POLICY DEVELOPMENT

## *Commerce Through the Great Lakes and St. Lawrence*

The Great Lakes/St. Lawrence transportation system is an established part of North America's commercial framework. It grew as a commercial water way from the earliest industrial development in North America until the last decade. Traffic has declined significantly since the peak in 1979, although volumes have fluctuated from year to year. Bulk commodities are the mainstay of the system. Within the Lakes, iron ore, coal and stone (construction aggregate) dominate.



As shown in the illustration above, the Great Lakes/St Lawrence is used for the movement of large volumes of bulk cargo to domestic and overseas markets, 165 million tonnes in 1988. Most traffic moves within the Lakes, with heavy flows of grain and iron ore through the Seaway. General cargo, which is mainly composed of iron and steel products, represents a much smaller portion of the trade into and on the Great Lakes. The illustration of Seaway traffic[1], below, demonstrates both the much smaller quantities (approximately a quarter of the Great Lakes traffic) and the difference in the composition of the traffic that moves through the Seaway. Here, grain (mostly Canadian export grain) dominates, but this has been changing.



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[1] The bases of the two illustrations are not strictly comparable. However, the only important general cargo traffic omitted from the first illustration is steel.

## GRAIN

The Seaway has traditionally been a major route for Canadian grain; for U.S. grain it has been an additional outlet of convenience. Both Canadian and U.S. grain movements, particularly to Europe, have declined. More Canadian grain now moves via west coast ports, and U.S. grain fluctuates according to the time of year in which sales are made and available handling capacity elsewhere.

## IRON ORE

Iron ore movement is mainly through Lake Superior to U.S. steel mills on Lakes Michigan and Erie. Canadian mills used to obtain iron ore in Minnesota and Ontario but,with the closure of Ontario mines, most of their supply now comes from the Quebec-Labrador region through the Seaway.

## COAL

Coal movement is mostly within the upper Lakes with some transiting the Welland Canal. Most Canadian movements are to Ontario Hydro at Nanticoke and the steel mills at Hamilton. Some coal comes from western Canada via Thunder Bay, but most Canadian demand is filled with U.S. coal moved across Lake Erie. There were exports of U.S. coal through the Seaway to Europe during the Polish coal mine strikes.

## POTASH

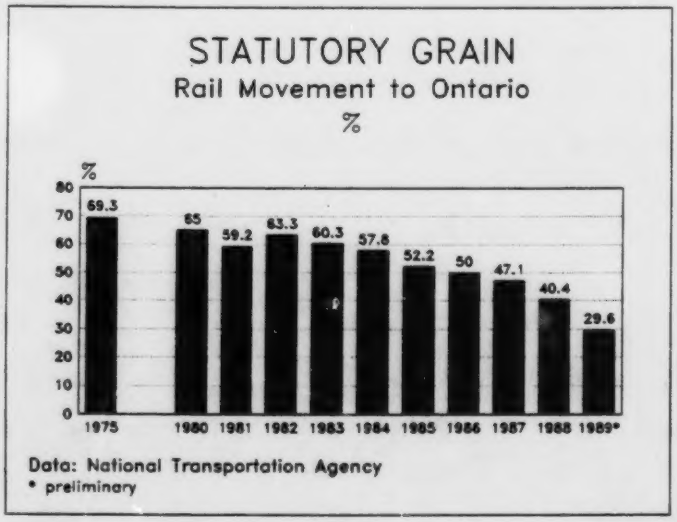
Canadian potash from Saskatchewan moves to the U.S. corn belt and Ontario. Up to two million tonnes have been loaded onto lakers at Thunder Bay for carriage to lake ports in the United States and Canada. Recently, however, much of the potash to Ontario has been supplied by rail.

## GENERAL CARGO AND STEEL

General cargo and container traffic, which were once expected to provide major flows through the Seaway, has not materialized, except for steel. Movements of steel through the Seaway have increased over the years and currently represent over 93% of general cargo traffic using the Seaway. Most is shipload imports from Europe to U.S. steel mills which exhibit many of the characteristics of a bulk commodity. Ontario imports and exports also use the waterway. Steel traffic is financially important to the Seaway since general cargo is assessed substantially higher tolls than bulk commodities.

## FORECASTING FUTURE TRAFFIC

As illustrated below, most Canadian export grain is now moving through British Columbia. From over 60% moving east prior to 1984, 70% of prairie grain (export and domestic consumption) now moves west. Responsible persons are predicting export grain reductions to 2 million tonnes annually through the Seaway. Since such grain flows would be insufficient to balance upbound iron ore, the *backhaul* would become *fronthaul*.



Data: National Transportation Agency
* preliminary

If current pessimism is founded, Ontario has reason for serious concern. However, it could prove as unfounded as the exponential traffic growth predictions of a decade ago. The volatility of world trade, and the underlying political structure, suggests credible scenarios exhibiting much greater variability than would have been envisaged a few years, or even months, ago. The extrapolation of intermediate term trends may not yield appropriate long term forecasts for the Seaway.

There would seem to be two reasonable policy approaches:

> presume that the future of the System is subject to so many variables as to be unpredictable, but recognize the intense volatility of the situation and the effect that this must have on all affected parties, particularly shippers and carriers;
>
> develop a comprehensive analytical approach to predicting future demand for Great Lakes/St Lawrence transportation and its impact on Ontario industry.

## IMPORTANCE TO ONTARIO

Although transportation and production adjustments may be available, Great Lakes/St Lawrence transportation is important to all industries utilizing it. Operations are organized presuming the marine mode of transport. Shippers not currently using the mode may benefit from having it as an alternative for negotiation purposes and contingency planning.

Reduced handling of grain has an impact on Thunder Bay. More difficult to assess, are the impacts of reduced and erratic grain flows on the viability of the Canadian Great Lakes shipping industry, on the iron ore traffic that moves as backhaul to the grain, and on Ontario's steel industry. Dependent on supplies of coal from the U.S. and iron ore from the lower St Lawrence, much of this key Ontario industry would not be competitive without economical Great Lakes/St Lawrence transportation. Further, steel is crucial (directly or indirectly) to most of the industry of southern Ontario.

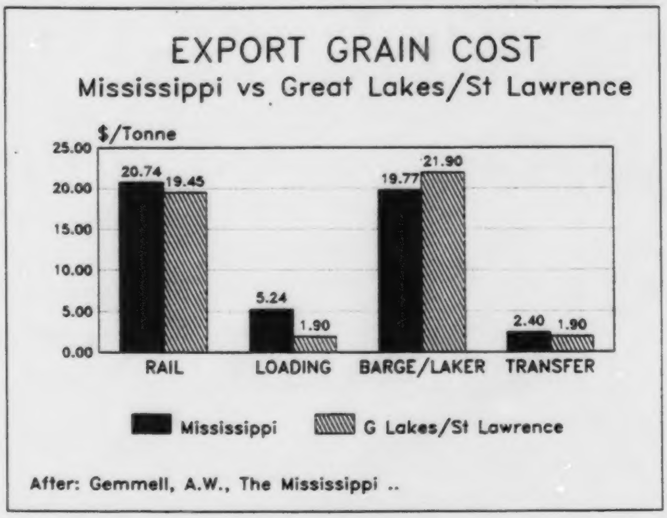
Its relative importance to various elements of the continental economy differs from that envisaged when the Seaway was built. It is a routing of convenience, not national or even regional necessity, to the U.S. To the Prairie Provinces, it is negligible as a routing for imports, and has become a marginal to minor facilitator for their natural resource exports. The Seaway is important to the economy of Quebec, but not crucial. It is steel-based industrial Ontario that has grown to depend on Seaway transport.

### *Transport Cost and System Competitiveness*

The study examines the economics of four major bulk commodities moving on the System; grain, iron ore, potash and coal. Alternatives considered are the Mississippi River system, the use of West Coast ports, direct rail by-passing Thunder Bay, and trucking. The economics of allowing foreign built vessels, foreign crews and immunity from Canadian taxes for the carriage of iron ore and export grain are also examined.

## THE MISSISSIPPI

The Mississippi is a potentially competitive routing for Canadian export grain. At least during periods of low U.S. domestic demand, both river barge carriers and elevator operators offer rates for Canadian grain that are lower than Great Lakes/St Lawrence costs, and there are no tolls. The Mississippi as a routing for Canadian grain, has been examined in several recent studies, the findings of one of which are illustrated below. It is important to note, when examining the Gemmell costs, that the key discrepancy is in the seemingly innocuous *loading terminal* estimate.



After: Gemmell, A.W., The Mississippi ..

While some data indicate that Canadian use of the Mississippi is economically attractive, the matter is not that simple. Since most Canadian grain is owned and shipped by the Canadian Wheat Board and is cleaned to Canadian Grain Commission standards there are impediments to movement through the United States including application of the *Western Grain Transportation Act*, supply of rail cars to transfer points, integrity of Canadian grain and inspection at port of shipping offshore.[2]

Diversion of significant grain traffic to this route would affect vessel capacity on the Great Lakes/St Lawrence, the economical carriage of iron ore and the viability of the Ontario steel industry. If the option of moving grain through the Seaway is to be maintained and/or the Seaway infrastructure and vessel capacity retained to move iron ore, the Mississippi route becomes unattractive.

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[2] The federal Minister of Agriculture recently released a discussion paper entitled *Growing Together* which opens up a discussion on many facets of agriculture in Canada, including the provisions of the Western Grain Transportation Act.

Saskatchewan potash moves down and New Brunswick potash up the Mississippi but these moves are not believed competitive with the Great Lakes.

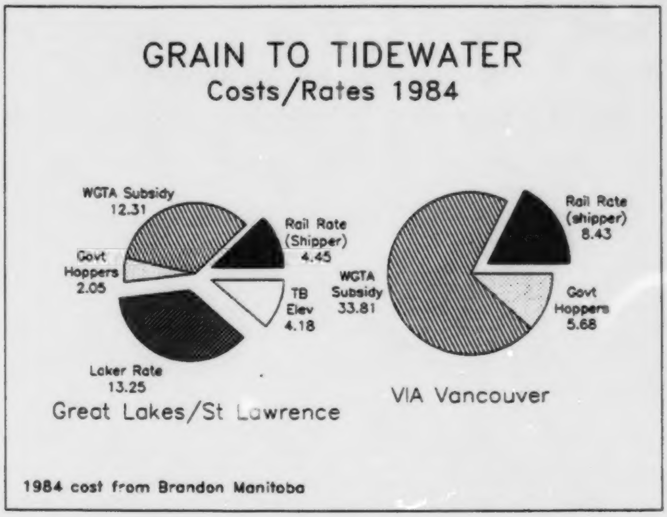
## EXPORT GRAIN THROUGH THE WEST COAST

The proportion of Canadian grain exported through the west coast is rising. The trend of Canadian export grain movement away from the Great Lakes/St Lawrence to the west coast is the greatest threat to the Canadian shipping industry. This is attributable to shifting world grain markets and a delivery system through Ontario and Quebec that is, at least in the eyes of the shipper, too expensive.

The *Western Grain Transportation Act* provides for a grain transportation cost subsidy structure, restricted to the rail mode, that biases the appearance of least cost transportation towards the west. Further, elevation and other terminal charges, at Thunder Bay and the Lower St Lawrence terminal elevators are large relative to rates charged on the west coast (for a single elevation) and to rates charged for elevation services in the U.S.

The illustration below is for a particular example grain origin. In this case, the origin is relatively close to Thunder Bay and the total cost, represented by the size of the *pies*, favours the Great Lakes routing. However, the area represented by the separated slices, payments that the grain shipper himself must make, favours Vancouver. Government contributions in the form of the *Western Grain Transportation Act* subsidy, and the provision of rail cars free of charge, account for the difference.

This unintended preferential subsidy of westward movement poses an immediate threat to Ontario's marine industry and the steel industry that depends on it. The Canadian Great Lakes bulker fleet is shrinking; there is still adequate vessel capacity to move current volumes of grain, but it would be marginal should volumes of the early 80's recur. Restoration of a Canadian built fleet would be slow.



Focused attention by the Province to this issue is recommended. Although a consensus is developing, that the WGTA will eventually be changed in a way that eliminates or reduces the westward bias[3], the situation seems urgent. West coast capacity could be further expanded, perhaps with an elevator at Roberts Bank. Such a development, with present Wheat Board cost calculations, would undoubtedly increase movement through the west coast at the expense of the Great Lakes/St. Lawrence System. Should expanded west coast capacity be established and the capability of the Great Lakes routing allowed to atrophy, WGTA adjustment might be too late.

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[3] Suggested possibilities include:

Paying the subsidy eastward to tidewater (as it is westbound);

A one time buy out by the federal government of the subsidy program, perhaps in the form of an annuity;

Cancellation of the subsidy, presumably with substitution of a program of support for western agriculture.

The discussion of this report summarizes what underlies the threat posed to grain movements through the Great Lakes/St Lawrence. It does not provide a full, solution oriented, analysis of the problem. Before a convincing case for an increase in eastbound grain traffic can be presented, knowledge gaps must be filled. Particularly conspicuous is the role of ocean rates in the equation. Then, a comprehensive case looking at the global picture including the impact on iron ore and steel must be prepared.

In most industries, the latter half on the 20th century has been characterized by *vertical integration*, whereby corporate entities control the destiny of their product from raw materials to final distribution. Competition, in the horizontal dimension, typically occurs between production-marketing-distribution chains. Vertical integration within the Canadian grain industry has not been encouraged by the regulatory structure. Rather, most links within the distribution chain, while cooperating operationally, compete with their vertical partners. Horizontally, effective regulation by preceding and succeeding links of the chain limit the scope for initiative.

A document, that summarizes global distribution costs for Canadian grain and their relationship to export grain marketing and the structure and regulation of the Canadian export grain industry, seems a prerequisite to effective Ontario representation.[4]

## DIRECT RAIL TO THE LOWER ST LAWRENCE

East coast Canadian ports are less a factor in bulk movements than in general cargo, especially containers. Some U.S. grain has been diverted to U.S. east coast ports because of shorter distances to tidewater and increased competitiveness of U.S. railways following deregulation.

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[4] Canadian export grain marketing is centrally managed and tightly controlled. Practically all export grain is cleaned to a high standard. Political changes in Eastern Europe may reduce the attractiveness of the *government to government* style of Canadian grain marketing, particularly with respect to those grain customers and potential customers best served from the East.

The railways are at once partners with the Great Lakes-St. Lawrence System and its major competitors. Grain, coal and potash are delivered to Thunder Bay for furtherance by water to destinations along the System and overseas. Confidential contracting in Canada has shifted the competitive advantage towards the railways. Railways are now able to price more selectively and less openly. By maintaining high rates to Thunder Bay, a railway can seize any competitive[5] traffic it chooses, subject only to its internal profit maximization and to the ability of the traffic to bear the transport cost and still compete in the markets concerned.

U.S. east coast ports are competitive with the Seaway for bulk traffic; Halifax and Saint John generally are not. The anticipated termination of At and East grain rates would increase the attractiveness of seasonal direct rail through Thunder Bay to the lower St Lawrence and perhaps Halifax.

## Canadian Grain

Most (Wheat Board) grain traffic is handled by Canadian lakers but some (non-Board) grain is carried by foreign flag ocean vessels. On a full economic cost long term basis, it is concluded that for grain in Canadian vessels:

| | |
|---|---|
| *with iron ore backhaul* | direct rail is not competitive with transfer to water at Thunder Bay |
| *with no backhaul* | rail may be, or may soon be,[6] just competitive, but only if Thunder Bay can be by-passed and cleaning there is not required |

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[5] In this sense, grain the routing of which is controlled by the Wheat Board is not competitive.

[6] Railway costs have been falling in real terms, and there are prospects for future cost efficiencies. The threat that direct rail poses to Great Lakes carriage must be expected to increase.

In the shorter term at least, institutional considerations, particularly the location of lower St Lawrence terminal elevators and the requirement that grain be cleaned, and that this be done at Thunder Bay or the west coast, will keep the balance in favour of the water mode. Termination of At and East grain rates would increase the prospect of seasonal direct rail through Thunder Bay to the lower St Lawrence and perhaps Halifax.

## Iron Ore

The economical supply of Labrador iron ore to the Ontario steel industry depends on the St Lawrence Seaway system, and on grain movements through the system to lower St Lawrence ports. Canadian grain and iron ore traffic have traditionally been complementary cargoes, with ore serving as backhaul for grain. Continued low grain movements will impact on the economics of iron ore transport. In future iron ore might move by water to Quebec City and rail to Hamilton, but at much higher cost. Without balancing grain movement, the cost of iron ore transport would more than double to over $13.00/tonne. Without Seaway transportation it could increase to some $21.00/tonne.

## Potash

The Great Lakes/St Lawrence transport of Saskatchewan potash to users in Southern Ontario is considerably cheaper than is rail. However, although substantial volumes move by water to U.S. destinations, much of the Ontario destined potash is delivered by rail. A solution to overcome the complex combination of inventory and terminal investment considerations, that has overcome rail's cost disadvantage in the movement of Saskatchewan potash to Ontario, would require detailed study.

Abolition of the ***At and East*** grain rates and abolition or extension to water of the *Atlantic Region Freight Assistance Act (which would reduce available empty hopper cars* *in the Maritimes)*, would enhance the competitiveness of the Seaway transport of New Brunswick potash[7].

## Coal

Coal for the Ontario steel industry and Ontario Hydro comes from two major sources, the Appalachian region of the U.S. and western Canada. Other Ontario coal demand is satisfied with U.S. coal moving across the Lakes. Most coking coal comes from the U.S. and will continue to do so because of steel industry preference. Movements of steam coal are expected to increase because of anticipated higher utilization of thermal plants in the 1990's. Although Ontario Hydro, as a publicly owned utility, may be more sensitive to environmental concerns, and therefore less predictable, industry must be expected to use as little product from the more expensive western Canada source as possible.

Great Lakes movements of western Canadian and U.S. coal to Ontario Hydro and the Ontario based steel companies are not threatened by modal competition. U.S. coal that need not pass through the Welland should be secure from modal competition indefinitely. Movements through Thunder Bay to Lake Ontario should also successfully resist rail competition, at least in the intermediate term. With a value *f.o.b.* the mine of the order of $35/tonne, and transportation costs of approximately $40/tonne for western Canadian coal and $20 for supplies from U.S. sources, coal is very sensitive to transportation cost.

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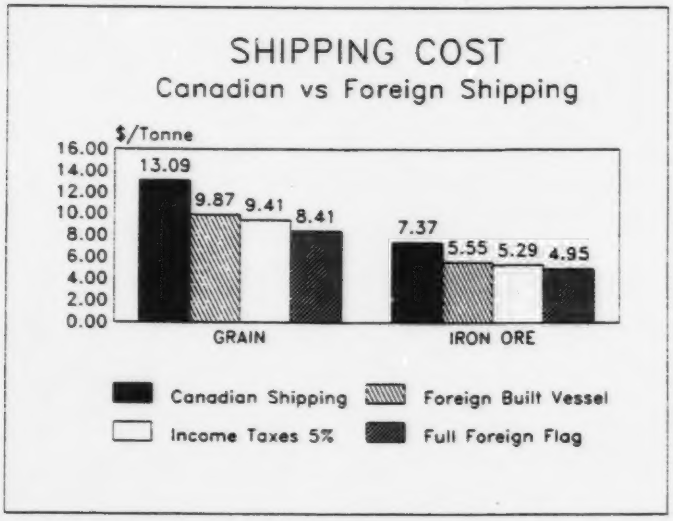
[7] While potash is a particularly important commodity for Ontario based agriculture, there are many other commodities that move from the Atlantic Region into Ontario, Quebec and further west assisted by this program. As the subsidies only apply by rail and truck, Great Lakes carriers lose. Study should address the retention of these subsidies and, if retained, their extension to marine movements.

## LOWER BUILDING, CREW AND TAXES COST

Low eastbound grain volumes have weakened the Canadian Great Lakes/St. Lawrence *bulker* fleet, used particularly for the transport of western grain and iron ore. Inevitably, the capacity of this Canadian flag shipping to respond to peaks in grain export demand will deteriorate. A possible, perhaps likely, response to an inability of Canadian shipping to handle contracted exports would be pressure for an easing of national restrictions on Great Lakes (coastal) carriage of domestic products, particularly grain.



Industry reports a distinct cost advantage to the offshore building of bulkers (delivered capital cost of about $17 million vs $35 million in Canada), coupled with attractive export development financing packages. Other savings would be obtained if Canadian income taxes were avoided and if foreign labour were used. The calculated (cumulative) effects of these possibilities are shown in the illustration above.

It is important to note that the use of foreign built vessels could reduce grain shipping cost from $13.09 to $9.87, or by 25%. Reduction of the shipping company corporate tax from 50% to 5% would increase the saving, but by only $3^1/_2$%. Acceptance of fully *deCanadianized* shipping, including wages at half of Canadian levels would save a further 8%, and produce costs of the order of 65% of those of the Canadian shipping industry.

The above savings would be at the cost of the Canadian shipping industry and thousands of Ontario jobs. There is a danger that the institutional hurdles, including waiver as provided under the Canada Shipping Act, could be crossed quickly if delivery of export grain were believed at issue. Thus, it is suggested that Ontario prepare its case in opposition, against the eventuality that introduction of foreign shipping is proposed, initially, as a temporary measure.

## GREAT LAKES BULKER FLEET

Although the supply of Canadian registered self-unloaders, suited to the movement of coal and other granular cargo, has shrunk somewhat from its high in the early 1980's, capacity is adequate and the age distribution of the vessels is reasonable. In contrast, the bulker fleet that moves export grain out of Thunder Bay (and iron ore to Ontario and U.S. mills) has been ageing and shrinking. With the exception of 9 carriers, the fleet exceeds 20 years of age. Maximum Seaway sized vessels, approximately 30 years of age, are being retired without replacement. The number of vessels has shrunk from 95 in 1978 to 50 in 1989. Available capacity (DWT) has dropped 120,000 tons over the last year.

## TRUCKING

The truck mode is not competitive with the cross-Lakes or Seaway bulk transport of major commodities. *Truck around* versus *water across* is an important consideration for certain general cargo (see the discussion on *cross lake* services below), but for bulk, trucking is more likely to complement Great Lakes carriage and enhance its competitive position with respect to direct rail. Direct trucking from the farm to Thunder Bay could become important competitively if a pay the producer or similar option were adopted on western grain.

### *Selected Concerns and Opportunities*

As the study progressed, it became apparent that Canadian Great Lakes shipping was on a downward trend, and that expedient exploitation of available opportunities is called for. Certain candidate opportunities, were given a degree of preliminary analysis. They were:

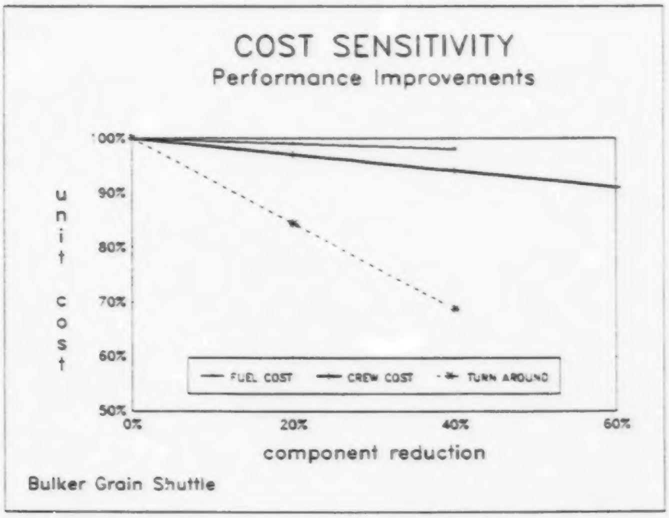
Technology and Operational Innovation
Season Extension
Overseas General Cargo and Port Marketing
Cross-Lakes Ferry Services

Of these, operational innovation holds promise of cost savings, and cross-lake ferry services may ultimately contribute to the Ontario/U.S. freight infrastructure. However, none holds prospects for reversal of the present decline of the Great Lakes/St Lawrence system.

## TECHNOLOGY AND OPERATIONS INNOVATION

The Great Lakes shipping industry is not competing successfully with the westward transport of Canadian, and the Mississippi transport of U.S., export grain. Further, the industry's cost advantage over the rail mode has been shrinking. The cost savings potential of technological and operations innovation is an opportunity to improve the industry's fortunes.

Available technology includes automated operation and navigation, and fuel saving measures. A vessel cost sensitivity analysis, illustrated below, indicated that labour cost savings will be more important than fuel cost savings but that improved vessel turnaround promises the greatest potential savings. It is concluded that the future of the system will not be brightened by implementation of advanced vessel technology. Advances in infrastructure and its operation, that would enable reduced cycle times, appear to hold greater promise.



## SEASON EXTENSION

Season extension would make the Seaway more attractive for both Canadian and U.S. grain exports, and for general cargo. For iron ore and coal, the advantages are less obvious. With falling demand, season extension is not currently an issue. Modest extension is attainable, and there may be niches for year around cross lake operation but year around Seaway operation is not a prospect.

While physically possible, cost and environmental considerations render it impractical. Capital cost could be in the billions of dollars. Seaway operating cost estimates for season extension vary from $10-50 million for a one month extension to $25-150 million for eleven months of operation. The major question may be who would be willing to pay the cost? Carriers would face increased operating costs and reduced efficiency that outweighed the value of increased vessel utilization. They would not operate year around unless shippers were willing to pay premium rates.

## OVERSEAS GENERAL CARGO AND PORT MARKETING

For container services, frequency, reliability and fast turnaround are paramount. Rail/truck delivery from ports such as Montreal can't be matched through the Seaway. Little or no container traffic moves into or on the Lakes, and this is not expected to change.

Two classes of general cargo vessel come into the Lakes; national carriers of countries (mostly east bloc) seeking hard currency, and vessels for project cargoes too large to conveniently move by rail or truck. Most of the former deliver steel. All are foreign flag and owned and provide little direct benefit to the Ontario and Canadian economies. To the extent that foreign vessels capture traffic that would be handled by domestic carriers of other modes, subsidizing the infrastructure to give them access is questionable.

Ports see general cargo as generating more port revenue and more employment than bulk. While there is an obvious link between port activity and jobs in the community, this relationship must be treated with caution.

## CROSS LAKE SERVICE

Cross lake services could have an interesting future. Possibilities include both tug and barge and self-propelled *roll on-roll off* ferries. A shallow draft fast catamaran design has attractive performance characteristics. During the study, interest in cross lakes services was encountered. Various origins and destinations were suggested as were systems to handle rail cars, rail cars and trucks, tractor trailer and trailer *drop-off* services.

Lake Erie service may be less attractive than Lake Ontario service due in part to less favourable operating conditions. Marine economics and operations are relatively straightforward, these types of services exist elsewhere. The length of season, or lack of year around operation, could be a factor in attracting users to such a service. Marine economics are controlled more by operating costs than by capital costs.

Engineering economy analysis of a hypothetical year around Lake Ontario operation was inconclusive; viability would depend on the usage of the system. The choice of site for such an operation would be crucial if trailer traffic is to be captured. Either *out-of-line-haul* to port or extensive drayage can quickly negate the lower cost of marine transport. Ultimate success is probably dependent on attracting major industries or truckers to integrate their terminal activities with the cross lake transit.

### *Infrastructure Costs, Financing and Administration*

Great Lakes/St Lawrence infrastructure operations costs[8] attributable to commercial freight traffic include:

| | |
|---|---|
| St Lawrence Seaway Authority | $61.5 million |
| U.S. St Lawrence Seaway Development Corporation | $10.1 million |
| Great Lakes Pilotage Authority | $9.7 million |
| Laurentian Pilotage Authority[9] | $28.7 million |
| Canadian Coast Guard | $40.9 million. |

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[8] These are primarily *operating* costs but include minor equipment expenditures that would conventionally be capitalized.

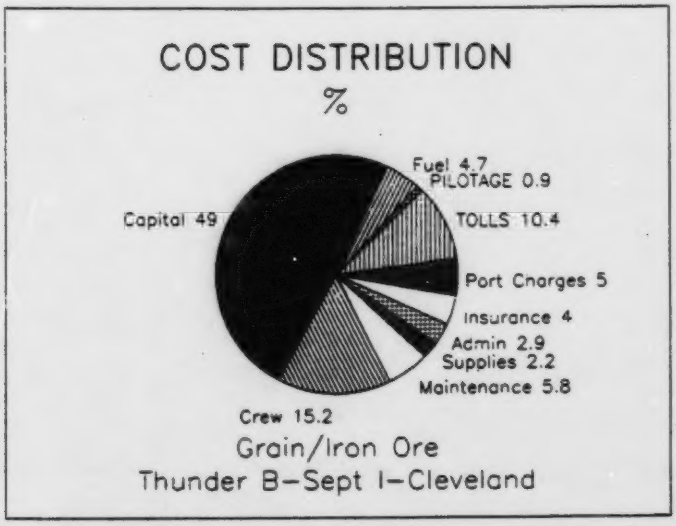
[9] Only a small portion applies to Great Lakes/St Lawrence traffic.

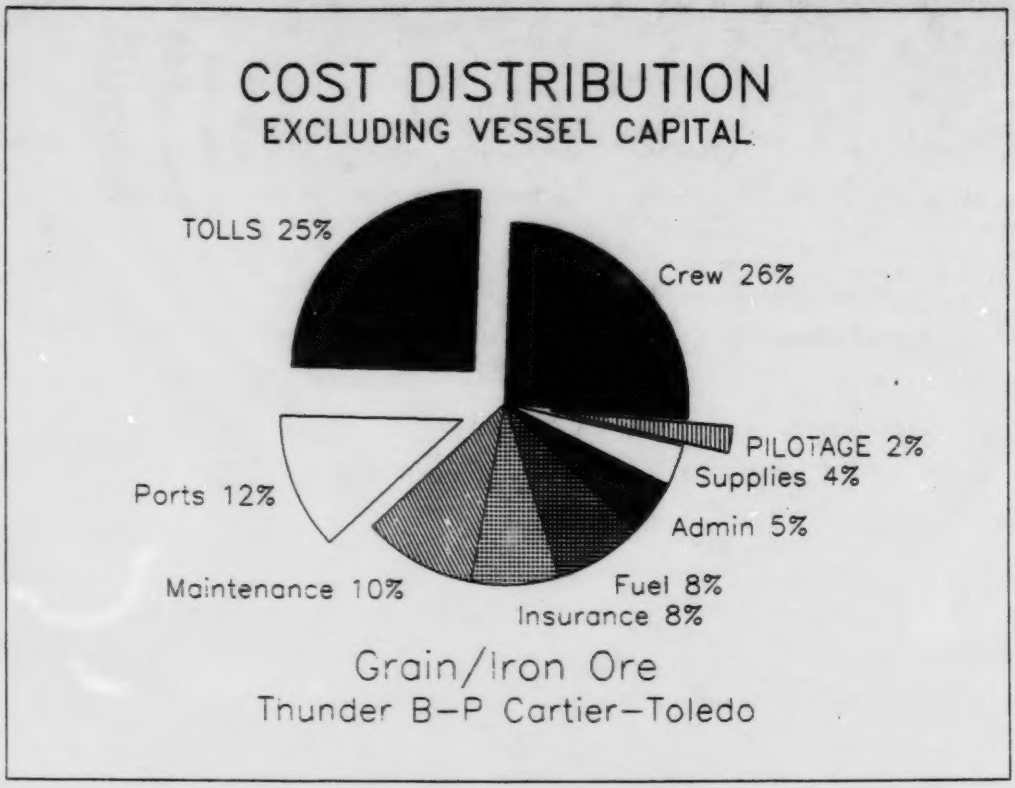
Also relevant are U.S. Coast Guard and Corps of Engineers costs, but these only concern Canadian traffic to a modest degree.

Canadian government expenditures on Great Lakes/St Lawrence operations, ports excluded, amount to approximately $ 120 million annually, of which some two thirds is covered by user charges. Seaway tolls and pilotage fees, ranges from nil to approximately 15% of total transportation cost, depending on facilities usage. Recovery of Canadian Coast Guard costs would amount to $1/tonne of cargo moving through the Seaway.

## INDUSTRY IMPACT AND EFFICIENT COST RECOVERY

The illustrations below show the distribution of *total* and *operating* cost for particular grain/iron ore movements. For other movements that make less (loaded) use of the Seaway, tolls are less significant. Full recovery of all infrastructure operations costs could add up to one third of Seaway vessel operating costs. A charge for invested capital could add considerably more.





Cost recovery does not necessarily contribute to equal treatment of modes and economic efficiency. Charging traffic for the fixed cost of infrastructure (and most of the cost is fixed) could lead to inefficient modal choice.

In lieu of formula based toll schedules, market based revenue generation schemes should be studied. Efficient fixed cost recovery should be designed so as not to create a disadvantage to marginal Great Lakes/St Lawrence transportation relative to its route and modal competitors. The particular danger is the loss of Canadian and U.S. export grain traffic.

## ADMINISTRATIVE STRUCTURE

The Canadian Coast Guard provides navigation and other services for the marine industry. The question is whether, for the Great Lakes/St. Lawrence, some of these services might be integrated under the mandate of the Seaway Authority. The St.

Lawrence Seaway Authority could become a more independent operation (Crown owned or otherwise), or it could become more closely controlled by Transport Canada.

While the federal government must absorb substantial operating deficits, full decision making power must remain there. If full or substantially enhanced cost recovery is to occur, the decision structure for the provision of St Lawrence/Great Lakes infrastructure services could open. Unified regional provision of Seaway, pilotage and Coast Guard services would allow a more commercial orientation and more effective user participation.

This study has concluded that Ontario Great Lakes shipping faces economic problems. Also, it seems that increased cost recovery must be entertained. It is essential, therefore, to seek a process that allows the package of infrastructure services to be tailored to meet the evolving needs of both industry and economic development. A mechanism, whereby stakeholders including the Province of Ontario and presumably Manitoba and Quebec have a decision role, deserves study.

## PORTS

It is said that there are too many ports in Canada, and too many port administrations. However, broad substantiating study of Ontario port infrastructure seems lacking. The true cost of port facilities is not documented; nor are the relative benefits of distributed local versus concentrated and more cost effective regional installations. The diversity of federal port organizations and environmental and development pressures for rationalization suggest that port policy will be an intermediate term issue.

When addressing the question of whether a reduction in ports would lead to improved efficiency, perhaps freeing up land for alternative uses and allowing for a greater concentration of commercial facilities, it is important to study the impact that rationalization would have on Ontario industry.

### *Priority Policy Study*

A number of topics where investigation of particular concerns or groups of concerns is believed to be of value to Ontario are mentioned above. These may also be found throughout the body of the report. The three areas for enquiry identified below are, however, considered to be of particular importance. They relate to issues where active and effective policy participation by Ontario could have a major impact on the growth and prosperity of the Province's industry.

## ONTARIO'S PERSPECTIVE ON THE EMERGING *WESTERN GRAIN TRANSPORTATION ACT* DEBATE

For the Province to present a forceful case concerning revisions to the western agricultural subsidy structure that eliminates or reduces bias against movement of western grain through Ontario, it should have documentation:

Tracing the impact of reduced Great Lakes grain flows through the iron ore, steel and secondary industries;

Illustrating the global distribution cost for grain;

Demonstrating the extent to which the current subsidy mechanism distorts grain transportation economics; and

Showing the westward bias resulting from Canada's grain marketing and distribution institutions.

## INTRODUCTION OF FOREIGN BUILT VESSELS/FLAG OPERATION INTO GREAT LAKES BULKER SERVICE

The Province should be prepared to counter industry representations for easing of the Canadian restrictions on carriage, particularly export grain transportation, between Canadian ports. Analysis should include potential impact on:

grain flows;

Canadian carriers and the viability of the Great Lakes shipping industry;

Ontario industry and its development; and

Provincial and national employment.

## INFRASTRUCTURE ADMINISTRATION AND PORTS RATIONALIZATION

Should the federal government move to increase cost recovery of Seaway and particularly Coast Guard services and/or to rationalize the multiple mechanisms whereby it administers ports, Ontario may have a unique opportunity to influence the organization of Great Lakes infrastructure management. Preparation could include:

Identification of candidate mechanisms for participation by industry and/or the Province(s) in strategic Great Lakes/St Lawrence infrastructure operations and pricing decisions, and their potential benefits to Ontario carriers and industry served by the marine mode;

Review of Ontario ports, their cost, viability and economic impact, and prospects for their rationalization that would benefit or, at least not dislocate, Ontario industries.

# CHAPTER 1

# COMMERCE THROUGH THE GREAT LAKES/ST LAWRENCE

This chapter describes the Great Lakes/St. Lawrence System and analyses commodity flows and the factors behind the flows. It also includes a brief review of forecasting the future for the System, and observations on the System's importance to the economy of Ontario.

***The Great Lakes/St Lawrence system grew as a commercial water way grew from the earliest industrial development in North America until the last decade. Since 1979, traffic has been fading although with year to year fluctuations. Most traffic remains within the Lakes, with heavy flows of grain and iron ore through the Seaway.***

***Canadian and U.S. grain exports, particularly to Europe, have declined. More Canadian grain now moves via west coast ports, and U.S. grain fluctuates according to the time of year in which sales are made and available handling capacity elsewhere.***

***Iron ore flows are mainly through Lake Superior to U.S. steel mills on Lakes Michigan and Erie. Most ore for Canadian mills comes from the Quebec-Labrador region through the Seaway.***

***Coal movement mostly remains within the upper Lakes with some transiting the Welland Canal. Most Canadian flows are to Ontario Hydro at Nanticoke and steel mills at Hamilton. Some coal comes from western Canada via Thunder Bay, but most Canadian demand is filled with U.S. coal shuttled across Lake Erie.***

***Canadian potash from Saskatchewan moves to the U.S. corn belt and Ontario via Thunder Bay and the Lakes. Recently, however, Ontario has mostly been supplied by rail.***

***General cargo and container traffic which were once expected to provide major flows through the Seaway have not materialized except for steel. Steel currently represents over 93% of general cargo traffic using the Seaway. Most of this traffic is imports from Europe to U.S. steel mills. Ontario imports and exports also use the waterway.***

***Dependent as it is on supplies of coal from the U.S. and iron ore from the lower St Lawrence, little of the Ontario steel industry could survive without economical Great Lakes/St Lawrence transportation, and steel is crucial (directly or indirectly) to most of the industry of southern Ontario.***

### Description

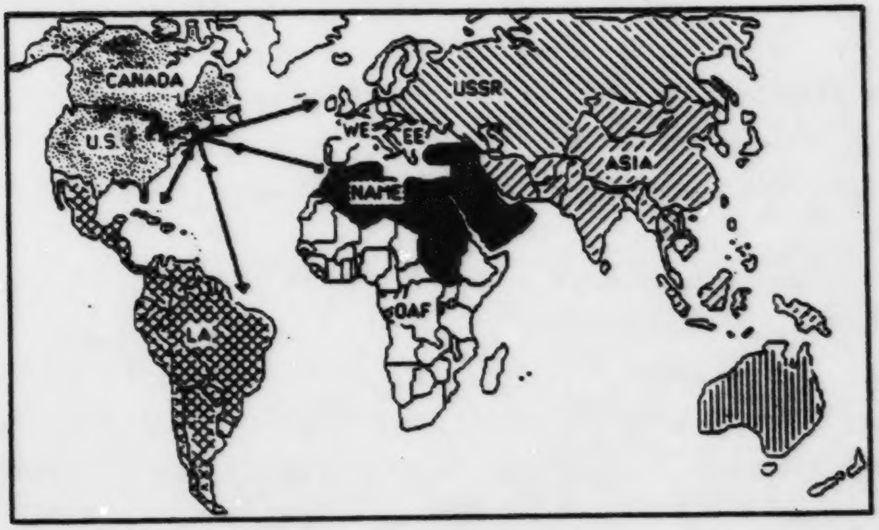
The Great Lakes/St. Lawrence Seaway transportation system (System) is an established part of North America's commercial framework, and as such is valuable to both Canada and the U.S. It is used for the movements of bulk cargo to domestic and overseas markets. General cargo, which is mainly composed of iron and steel products, represents a smaller portion of the trade into and on the Great Lakes.

The opening in 1959 of the North American hinterland to world shipping, as a result of the St. Lawrence Seaway, has been of major importance to the economies of Canada and the U.S., particularly to the Great Lakes - Seaway region. This region, which includes two Canadian provinces and eight U.S. states, is larger than all of western Europe and contains nearly one third of the combined population of Canada and the U.S. as well as a major portion of the combined industrial infrastructure. Goods of all kinds are shipped over long distances at reasonable cost by ships which, after most liquids pipelines, remain the lowest energy - consuming carriers.

The System, which extends from Anticosti Island to the western shores of Lake Superior, can be divided into four sections. The first extends from Anticosti Island to Montreal. The second and third include the St. Lawrence Seaway and Lake Ontario while the fourth is Lake Erie and west. This chapter will concentrate on traffic moving within and through that part of the System between Montreal and the western shores of Lake Superior.

Within their jurisdictions, the Great Lakes and St Lawrence Seaway[10] system is administered by Canadian and U.S. government agencies.

**THE SEAWAY & WORLD TRADE**



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[10] The Seaway is composed of two sections, the Montreal-Lake Ontario (MLO) and the Welland Canal (Welland). The MLO has seven locks (5 in Canada and 2 in the United States) while the Welland has eight locks, all in Canada.

## TRAFFIC COMPOSITION

Most traffic within and through the Great Lakes/St Lawrence is bulk cargo with the individual commodities varying in importance from one part of the System to another. The largest movement is iron ore followed by coal, stone, grain[11], and petroleum products[12]. The major traffic through the Seaway is traditionally export grain, followed by iron ore, coal and iron and steel products (general cargo). It is notable that almost all grain carried on the Great Lakes is also carried through the St. Lawrence Seaway whereas a smaller portion of the other commodities use the Seaway.

Because of the large number of commodities moved within and through the System, it was decided to concentrate on those most relevant to Canada and Ontario and to the issues that surround the Seaway. Four bulk commodities were selected; grain, iron ore, coal and potash. The first two move within and through the Great Lakes/St Lawrence while the latter two mainly remain within the lakes. Also selected for special consideration in this chapter was the transport of steel, particularly as respects overseas imports and exports. This, together with iron ore and coal movements, completes the general framework against which the relationship of Great Lakes and St Lawrence Seaway transportation to the health of Ontario's steel industry can be viewed.

Traffic increased from 144 million tonnes in 1959 to 213 million tonnes in 1979. In the early 1980's, traffic declined, largely as a result of an economic recession and the lack of market competitiveness of U.S. steel mills. With improved economic conditions and improved U.S. steel industry competitiveness (including voluntary restraints) traffic levels improved substantially by 1988 to 164 million tonnes. It is also important to understand that the decline in former traffic was actually greater than the above comparison would indicate since new traffic was secured to partially counterbalance the losses.

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[11] In this context, grain includes wheat, corn, barley, oats, rye, soybeans, flaxseed, and sunflower seed.

[12] The petroleum products grouping includes crude oil, gasoline, fuel oil and other petroleum products.

**Great Lakes Bulk Commerce**

(In Million Tonnes)

| Year | Iron Ore(1) | Coal | Stone | Grain | Petroleum Products | Cement | Potash | Total |
|---|---|---|---|---|---|---|---|---|
| 1988 | 61.9 | 36.7 | 32.2 | 17.3 | 10.9 | 3.8 | 1.5 | 164.4 |
| 1987 | 56.0 | 34.2 | 30.1 | 20.3 | 10.5 | 3.5 | 1.5 | 156.0 |
| 1982 | 39.1 | 33.3 | 13.7 | 25.6 | 13.2 | n/a | 1.6 | 126.4 |
| 1979 | 93.5 | 41.6 | 33.5 | 26.2 | 17.8 | n/a | 0.4 | 213.0 |
| 1959 | 52.3 | 42.8 | 23.7 | 12.3 | 13.1 | n/a | n/a | 144.2 |

Note: (1) From Lake Superior, Lake Michigan and from Eastern Canada to U.S. and Canadian steel mills along the Great Lakes - St. Lawrence Seaway.

Source: Based on data from the Lake Carriers' Association

Coal traffic peaked at 50 million tonnes in 1966, declined to 33.3 million tonnes during the recession, but recovered to almost 37 million tonnes in 1988 largely as a result of strong demand by Ontario Hydro. Drought conditions on the prairies, and increased exports through west coast ports, reduced grain shipments through the Great Lakes/St Lawrence from a peak of over 28 million tonnes in 1980 to 17 million tonnes in 1988. Annual traffic data from 1959-1988 are summarized in Appendix A.

### *Traffic On the St. Lawrence Seaway*

The Seaway is comprised of two distinct sections, the Montreal-Lake Ontario (MLO) and the Welland Canal (Welland). While the modern Welland was opened about 1930, the Seaway is generally referred to as starting operations in 1959 with the opening of the MLO.

## ST LAWRENCE SEAWAY TRAFFIC

### Traffic on the Welland Canal

(Million Tonnes)

| Year | Iron Ore | Coal | Stone | Grain | Petrol Product | Potash* | Iron & Steel | Other | Total |
|---|---|---|---|---|---|---|---|---|---|
| 1988 | 7.1 | 7.0 | 1.0 | 16.1 | 1.0 | 0.4 | 3.0 | 7.9 | 43.5 |
| 1987 | 6.2 | 5.6 | 0.9 | 19.1 | 0.8 | 0.3 | 2.7 | 7.1 | 42.7 |
| 1982 | 7.0 | 7.1 | 0.1 | 25.2 | 1.4 | 0.2 | 1.7 | 6.3 | 49.0 |
| 1979 | 15.1 | 7.8 | 1.5 | 26.1 | 2.1 | 0.1 | 2.9 | 10.6 | 66.2 |
| 1959 | 6.3 | 4.4 | 0.7 | 7.8 | 1.3 | 0.0 | 0.3 | 4.2 | 25.0 |

### Traffic on the Montreal - Lake Ontario Section

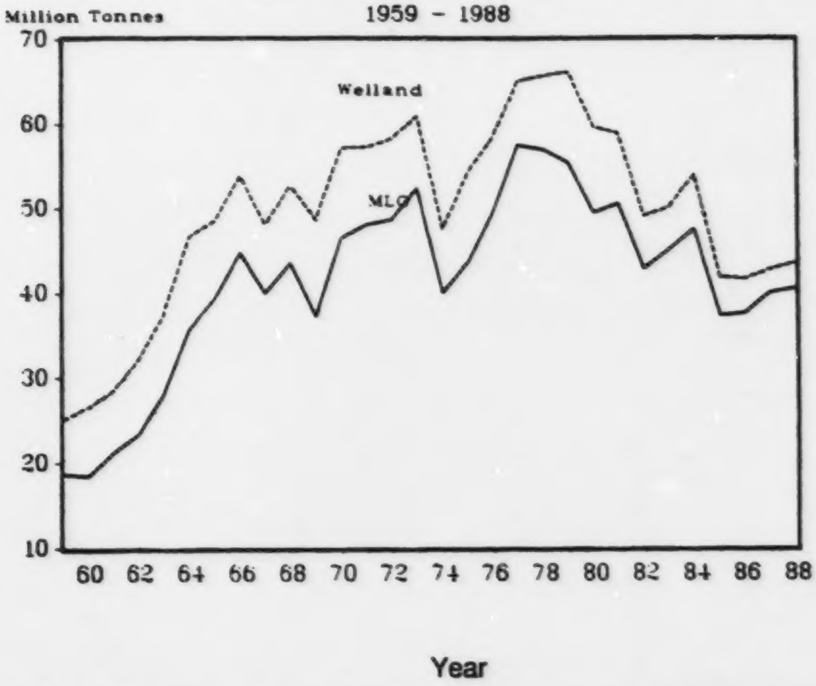
(Million Tonnes)

| Year | Iron Ore | Coal | Stone | Grain | Petrol Product | Potash* | Iron& Steel | Other | Total |
|---|---|---|---|---|---|---|---|---|---|
| 1988 | 10.8 | 0.7 | 0.4 | 15.5 | 1.3 | 0.3 | 4.3 | 7.3 | 40.6 |
| 1987 | 9.6 | 0.2 | 0.2 | 18.3 | 0.9 | 0.2 | 3.6 | 7.0 | 40.0 |
| 1982 | 7.4 | 1.2 | 0.0 | 24.2 | 1.0 | 0.1 | 2.8 | 6.1 | 42.8 |
| 1979 | 14.8 | 0.5 | 0.4 | 24.7 | 2.7 | 0.0 | 3.1 | 9.1 | 55.3 |
| 1959 | 5.6 | 1.1 | 0.0 | 6.6 | 1.3 | 0.0 | 0.4 | 3.7 | 18.7 |

Note: (*) estimated

Source: Based on data from the St. Lawrence Seaway Authority, St. Lawrence Seaway Traffic Report.

The Seaway handled 25 million tonnes through the Welland, and almost 19 million tonnes through the MLO in its first season. Despite periodic fluctuations, commodity flows grew peaking at 66 million tonnes in the 1979 season on the Welland, and 57.5 million tonnes in 1977 on the MLO. Traffic dropped drastically following 1979, mainly due to the deep and prolonged economic recession which crippled the region's steel industry, reaching 49 million tonnes on the Welland and 43 million tonnes on the MLO respectively in 1982. The economic recovery which started in mid-1983 contributed to a slight traffic rebound in 1984, but this short recovery was followed, once again, by a drastic decrease to 42 million tonnes on the Welland and to 37 million tonnes on the MLO in 1985. Most of this decrease reflected reduced grain traffic through the Great Lakes/St Lawrence. Overall, (see figure below) traffic has increased since then, but grain continues to decline.


HISTORICAL CARGO TRAFFIC THROUGH THE SEAWAY
1959 - 1988

As stated earlier, decreased cargo movements, since 1979, mainly result from depressed economic conditions and a decline in industries using the Great Lakes/St Lawrence (such as U.S. steel producers) and supply of the System's traditional producing and consuming markets.

## GRAIN

Grain shipped through the Great Lakes/St Lawrence consists primarily of Canadian and U.S. export shipments destined mostly for Europe, the Soviet Union, North Africa, the Middle East and Latin America. Most of this grain is carried by Canadian lakers to lower St. Lawrence ports for transshipment to ocean vessels. A smaller portion, consisting particularly of feed grain for domestic use is destined for Hamilton, Toronto, Montreal and other river ports. There is also a considerable quantity of grain, mainly from the U.S., which is shipped directly overseas in foreign flag ocean vessels. The following figures show comparative grain tonnages for major Great Lakes/St Lawrence ports of origin and destination.

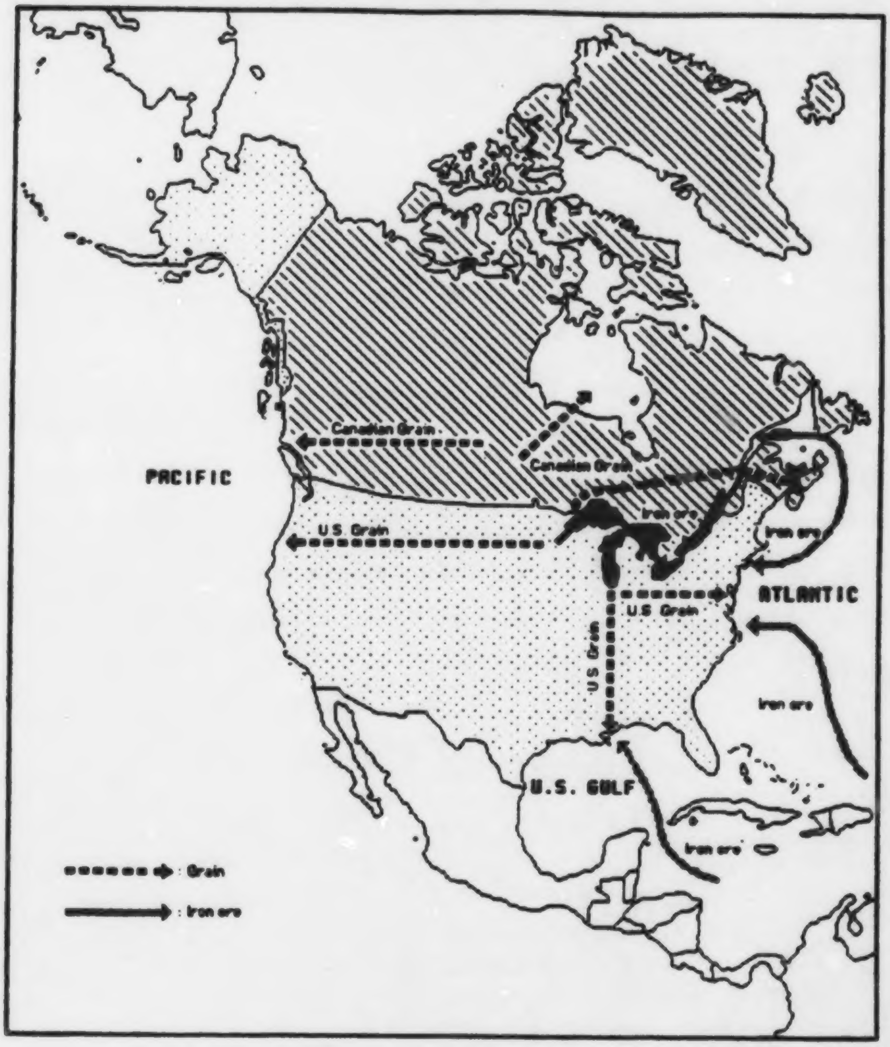
### Grain Tonnages

(millions of tonnes)

| **Canadian Port of Origin** | **1987** | **1988** |
|---|---|---|
| Thunder Bay | 13.90 | 10.60 |
| Sarnia | 0.30 | 0.30 |
| Windsor | 0.20 | 0.10 |
| **U.S. Port of Origin** | **1987** | **1988** |
| Duluth-Superior | 3.20 | 4.50 |
| Milwaukee | 0.50 | 0.50 |
| Chicago | 0.50 | 0.40 |
| Toledo | 1.60 | 0.90 |
| **Canadian Port of Destination** | **1987** | **1988** |
| Hamilton | 0.21 | 0.17 |
| Prescott | 0.15 | 0.14 |
| Toronto | 0.17 | 0.03 |
| Montreal | 0.74 | 1.90 |
| Quebec City | 2.97 | 2.26 |
| Baie Comeau | 2.05 | 2.61 |
| Sorel | 0.86 | 0.64 |
| Trois Rivieres | 0.87 | 0.62 |
| Port Cartier | 3.20 | 2.50 |

Source: Based on data from the St. Lawrence Seaway traffic report and Lake Carriers' Association

## THE SEAWAY AND ALTERNATIVE ROUTES


Canadian Grain
PACIFIC
Canadian Grain
Iron ore
U.S. Grain
Iron ore
ATLANTIC
U.S. Grain
U.S. Grain
Iron ore
U.S. GULF
Iron ore
: Grain
: Iron ore

The quantity of grain shipped through the Great Lakes/St Lawrence is influenced by numerous factors. Explored in Chapter 2, these include: world and domestic grain supply and demand conditions, agricultural policies of both major grain producers and countries traditionally supplied through the System, capacity of the grain transportation system in both Canada and the U.S., delivery dates for which the grain is ordered, U.S. agricultural and foreign aid policy, development and modernization of Great Lakes/St Lawrence port and grain-handling facilities, and finally, laker fleet efficiency and the comparative costs of transportation.

## CANADIAN GRAIN

There are four normal outlets for Canadian grain; the Great Lakes/St. Lawrence System (either direct overseas shipment from Thunder Bay in foreign flag vessels, or carriage by Canadian vessels to the lower St. Lawrence for transshipment),[13] rail to Canada's Pacific ports, direct rail to lower St. Lawrence and Atlantic ports, and rail to Churchill. While all grain shipped out of Pacific ports (and Churchill) is for export, grain moves eastward by water for both export and domestic use. The following table shows grain exports through each Canadian outlet and the percent share by each route. The decline in flows through the Great Lakes/St Lawrence, while shown in percentage terms below, also applies to absolute volume.

**Canadian Grain Exports by Outlet**

| | Great Lakes | Atlantic | Churchill | Pacific |
|---|---|---|---|---|
| | | (Percent) | | |
| 1987-88 | 39.8 | 1.9 | 1.9 | 55.4 |
| 1986-87 | 43.0 | 1.8 | 1.8 | 53.2 |
| 1983-84 | 52.5 | 2.5 | 2.1 | 41.9 |

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[13] There is also one other lesser alternative, water movement to "inland points" (as defined in Section 272 of the *Railway Act* as amended by the *National Transportation Act, 1987*) and rail movement to export position. See discussion in Chapter 2.

Eastward movement of Canadian grain is 85% wheat, 7% barley and 3% corn and flaxseed. The remainder is rye, and oats. Although, canola is an important Pacific export, easterly flows are insignificant.

The opening of the MLO in 1959, combined with major export developments, notably to the Soviet Union, led to an increase in movements through the Great Lakes/St Lawrence from about 4 million tonnes (1959) to the record level of 17 million tonnes in 1983. By 1988, this had dropped to only 10 million tonnes.

The competitive position of the eastern route for Canadian grain exports can be assessed by examining the composition of the overall Canadian grain export market. Western Europe and the Soviet Union are major traditional markets for Canadian grain exports through the Great Lakes/St Lawrence. As these markets have declined in importance recently, so too have shipments through the System. For example, in 1983-84 the percent of Canadian exports to these areas was 37.8% but by 1987-88 this had declined to 22.4%. Similar declines (from 52.8% to 39.8%) were registered for the Great Lakes/St Lawrence as a whole. By contrast, the Asian market, mainly supplied from west coast ports, increased in significance to a dominant 45 percent of exports in 1987-88. For details, please refer to Appendix A.

**Canadian Grain Exports Through the Great Lakes/St. Lawrence**

| **Market** | 1983-84 | 1986-87 | 1987-88 |
|---|---|---|---|
| | (Percent) | | |
| Western Europe | 21.0 | 15.4 | 16.3 |
| Eastern Europe | 6.4 | 2.3 | 2.5 |
| Soviet Union | 35.7 | 43.9 | 30.2 |
| NA-ME | 17.8 | 11.6 | 25.3 |
| Latin America | 10.2 | 16.2 | 14.7 |
| Asia | 1.3 | 3.1 | 3.3 |

Source: Based on data from the Canadian Grain Commission.

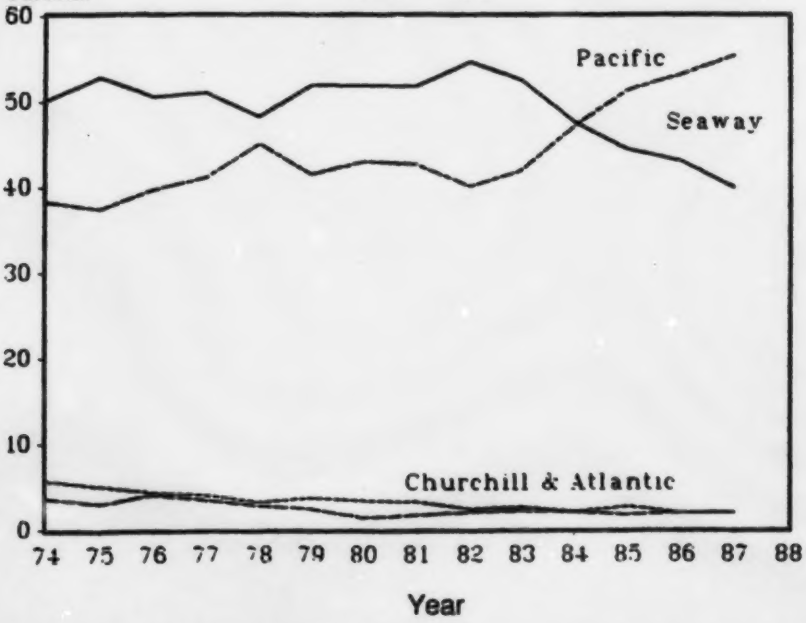
**Canadian Grain Exports Through West Coast Ports**

| **Market** | 1983-84<br>(Percent) | 1986-87 | 1987-88 |
|---|---|---|---|
| Western Europe | 3.2 | 0.6 | 0.6 |
| Eastern Europe | 2.4 | 0.0 | 0.0 |
| Soviet Union | 12.8 | 6.8 | 6.5 |
| NA-ME | 6.4 | 5.6 | 9.4 |
| Latin America | 3.2 | 4.3 | 5.3 |
| Asia | 71.2 | 62.0 | 77.6 |

Source: Based on data from the Canadian Grain Commission.

Prior to 1983-84, Great Lakes/St Lawrence and Pacific outlets appeared to be complementary rather than competitive, although with increasing volumes straining capacity, this was probably illusory. With demand from the Soviet Union higher than demand from China, the Great Lakes/St Lawrence share of total Canadian grain exports was traditionally higher than that of the west coast ports.

SHARE OF CANADIAN OUTLETS OF CANADIAN GRAIN EXPORTS
1974 - 1987



Changes in grain market patterns since 1983-84 (particularly with Western Europe becoming a net exporter) have contributed to the decline in the Great Lakes/St Lawrence's share of Canadian grain exports and, in 1985, grain exported through west coast ports exceeded that through the System for the first time.

Recently, ocean rates have been depressed because of poor grain markets, depressed sea-borne trade and an oversupply of ocean vessels. This favours movement through the west coast. Domestic transportation rates have become a greater share of the transport cost, especially since the eastward alternative includes transport east of Thunder Bay to point of export at unsubsidized rates.

Other factors contributing to the effective shift towards the Pacific include the construction of major elevators at Prince Rupert and replacement of the statutory *'Crow'* rate schedule by the rate and subsidy regime of the *Western Grain Transportation Act* (WGTA). Under the *Crow*, the railways lost significantly on all grain movements. To the extent possible, it was in their direct interest to encourage the cheapest route to a port; for most Prairie grain that amounted to Thunder Bay. Movements to this port benefitted from abundant capacity and timely delivery. Shipments through the mountains were plagued by insufficient capacity, car supply problems, late vessel arrivals and a myriad of other complications.

Under the WGTA, however, although the shipper only pays a fraction of the total, the railways are now reimbursed for their long run variable cost plus a 20% margin on volume related costs. Because of this, and with a longer average haul to the west coast, the railways benefit (directly or indirectly) from increased tonnages through the west coast. This fits neatly with a system, whereby the Canadian Wheat Board pays the farmer for his grain, deducting for rail transport on the basis of the shipper's portion of the rate to the nearest port. The Board pays the railways the shipper's portion to actual WGTA destination (about a quarter of the total rail rate). This does not encourage an efficient use of transportation. On water moves through the System, the Board must pay the full cost of the transportation.

## U.S. GRAIN

U.S. grain traffic through the Great Lakes/St Lawrence depends mainly upon the demand from traditional markets, particularly Western Europe and, to a lesser degree, North Africa and the Middle East. Recent declines in demand from Europe have seriously reduced the amount of U.S. grain exported via this route.

The U.S. transportation system tends to experience capacity limitations during cyclical demand peaks as a result of the sudden increase in the volume of various commodities. Surges in grain shipments resulting from this situation usually move through the Great Lakes/St Lawrence. Soft grain markets over the last few years, coupled with the decline in ocean rates, resulted in reduced U.S. grain exports. With surplus capacity available, transportation rates (particularly Mississippi barge rates) fell, and consequently U.S. grain via the Great Lakes/St Lawrence declined.

While some contend that the Staggers Rail Act of 1980 contributed to reducing the cost of moving U.S. grain by rail, it can be seen from the following figure that U.S. grain exported through the Atlantic surpassed, in absolute terms and in percentage share, U.S. grain shipped through the Great Lakes/St Lawrence since 1974, six years before the Staggers Act.[14] However, since 1986, the Great Lakes/St Lawrence share of total U.S. grain exports has exceeded that of the U.S. Atlantic Seaboard outlet.

When U.S. grain exports are strong during the first three months of the calendar year (when the Seaway is closed), the U.S. Atlantic seems to gain the upper hand in cumulative grain exports for the year. When exports are soft during the first three months, the cumulative traffic advantage tends to shift toward the Great Lakes/St Lawrence.

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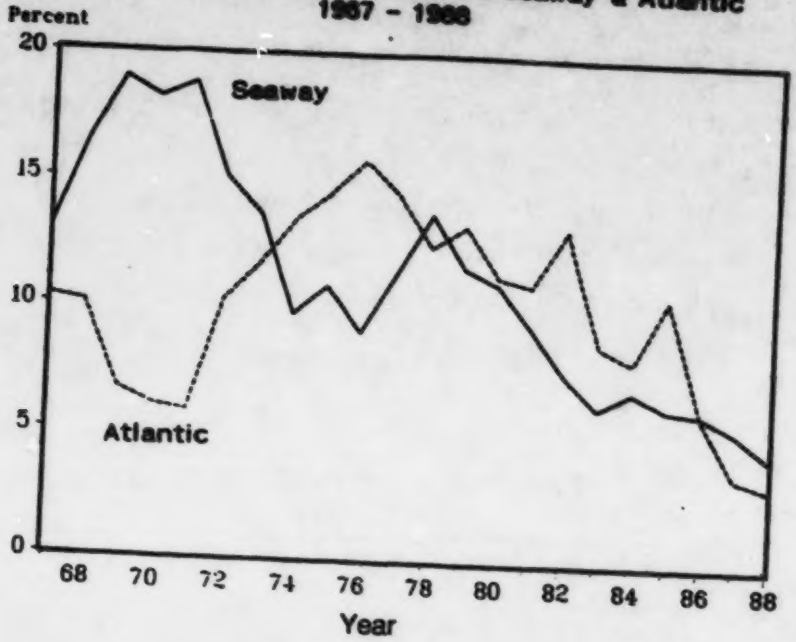
[14] For a discussion of rail factors influencing grain movements, please refer to Chapter 2.

**Percent of U.S. Grain Exports Via Seaway & Atlantic**
**1967 - 1988**



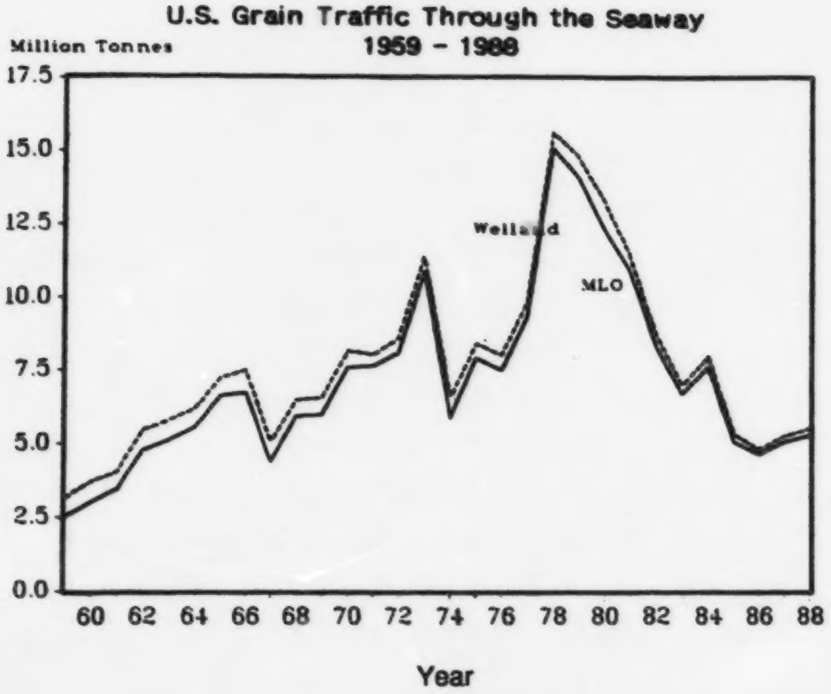
U.S. grain exports move to overseas destinations from four major U.S. coastal areas: the Great Lakes, the Atlantic, the Gulf of Mexico and the Pacific. These outlets are linked to U.S. grain-producing areas by water (barge) and/or rail transportation. U.S. grain exported via the Great Lakes/St Lawrence is destined for Europe (including the Soviet Union), North Africa and the Middle East, and Latin America. Some of this traffic is carried by Seaway-size lakers to lower St. Lawrence ports for trans-shipment to ocean vessels. The rest is shipped directly from the Great Lakes to overseas destinations in ocean vessels.

**U.S. Grain Exports by Outlet**

| Outlets | 1978 (Percent) | 1986 | 1987 | 1988 |
|---|---|---|---|---|
| Great Lakes/Seaway | 13.8 | 6.1 | 5.4 | 4.4 |
| U.S. Atlantic | 12.5 | 6.0 | 3.6 | 3.2 |
| U.S. Gulf | 61.1 | 68.8 | 70.6 | 66.2 |
| U.S. Pacific | 12.6 | 19.1 | 20.4 | 23.4 |

Source: Based on data from the United States Department of Agriculture.

U.S grain traffic, on the Welland rose from 3.1 million tonnes in 1959 to 14.5 million tonnes in 1978. In the interim, traffic fluctuated through two major cycles. A third major cycle appears to have started after 1979 reaching bottom in 1986 when U.S. grain traffic through the Welland dropped to 4.8 million tonnes. A slight upward trend, commencing in 1987, brought this traffic to about 5.5 million tonnes in 1988.



Recent U.S. grain movements through the Great Lakes/St Lawrence can be best explained when examined in the context of world grain trade. In the 1980 crop year, when world grain trade was 230 million tonnes, U.S. grain exports were 133 million tonnes, representing 58 percent of the trade. While the world grain trade declined to an estimated 206 million tonnes in 1986, U.S. grain exports dropped to about 95 million tonnes, or only 46% of world grain trade. Exports from other suppliers actually rose by 14%.

As for Canadian exports, U.S. grain markets shifted from Western Europe and the Soviet Union to Asia in the period from 1978 to 1987. It should, however, be noted that Asia has for many years been an important U.S. export market.

**U.S. Grain Exports by World Market**

| **World Market** | **1978** | **1986** | **1987** |
|---|---|---|---|
| | | (Percent) | |
| Western Europe | 31.1 | 18.4 | 14.3 |
| Eastern Europe | 3.8 | 1.3 | 2.4 |
| Soviet Union | 13.6 | 5.7 | 11.1 |
| North Africa-Middle East | 8.5 | 18.3 | 18.0 |
| Latin America | 10.3 | 10.9 | 8.8 |
| Asia | 30.5 | 40.7 | 43.7 |

Source: Based on data from the United States Department of Agriculture.

## IRON ORE

There are major iron ore flows on the Great Lakes/St Lawrence. The greatest tonnage is from mines west of Lake Superior (the Mesabi Range) to U.S. steel mills on or near the upper lakes. The second major flow is upbound from the Quebec-Labrador region.[15] This ore is brought south by rail to Gulf of St. Lawrence ports and then moved by vessel to Canadian steel mills, primarily on Lake Ontario, and to U.S. steel mills on Lake Erie. Part of the ore continues by rail to the Pittsburgh-Johnstown-Youngstown region. Iron ore from the Steep Rock area of Ontario through Thunder Bay has ceased, and the mine is now permanently closed.

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[15] A smaller import movement has developed in recent years from offshore, mainly Brazil, with direct ocean carriage into the St. Lawrence (generally to the Port of Quebec) where it is unloaded and stored temporarily on the dock. The ore is subsequently loaded into lakers for carriage into the lakes, primarily to U.S. steel mills.

## Major Iron Ore Shipping Ports

| | 1978 | 1987 | 1988 |
|---|---|---|---|
| | | (Million Tonnes) | |
| **Canadian Ports** | | | |
| Thunder Bay | 4.33 | 0.00 | 0.00 |
| Depot Harbour | 0.66 | 0.00 | 0.00 |
| Little Current | 0.31 | 0.00 | 0.00 |
| Picton | 0.05 | 0.00 | 0.00 |
| Point Noire | 3.55 | 4.09 | 4.67 |
| Port Cartier | 2.55 | 1.24 | 1.27 |
| Sept Isles | 5.83 | 2.52 | 2.63 |
| **U.S. Ports** | | | |
| Escanaba | 11.25 | 5.39 | 6.67 |
| Marquette | 5.91 | 6.66 | 7.57 |
| Superior | 12.31 | 11.05 | 11.76 |
| Duluth | 13.36 | 7.48 | 6.81 |
| Two Harbours | 9.33 | 6.69 | 10.44 |
| Silver Bay | 9.46 | 0.18 | 0.00 |
| Taconite Harbour | 8.61 | 7.72 | 7.60 |
| **TOTAL** | **87.51** | **53.02** | **59.42** |

Source: Based on data from the American Iron Ore Association

## Iron Ore through the Seaway; Origin/Destination Flows by Port, 1987

(Million Tonnes)

| | Port of Destination | | | | | | |
|---|---|---|---|---|---|---|---|
| | Hamilton | Nanticoke | Thunder Bay | Trenton | U.S. Ports | All Others | TOTAL |
| **Port of Origin** | | | | | | | |
| Contrecoeur | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.05 |
| Hamilton | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.06 | 0.08 |
| Point Noire | 1.55 | 0.48 | 0.00 | 0.05 | 2.09 | 0.00 | 4.17 |
| Port Cartier | 1.01 | 0.00 | 0.00 | 0.00 | 0.30 | 0.02 | 1.33 |
| Quebec | 0.08 | 0.00 | 0.02 | 0.00 | 1.36 | 0.00 | 1.46 |
| Sept Isles | 1.63 | 0.00 | 0.00 | 0.00 | 0.89 | 0.00 | 2.52 |
| U.S. Ports | 0.87 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.87 |
| Latin America | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.05 |
| All Other | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **TOTAL** | **5.14** | **0.48** | **0.02** | **0.05** | **4.76** | **0.08** | **10.53** |

Source: Estimated and based on data from Statistics Canada and the St.Lawrence Seaway Traffic report.

Iron ore traffic on the Great Lakes/St Lawrence is determined by the demand for finished iron and steel products in the U.S. and Canada. This, in turn, depends upon general economic conditions and the steel usage factor in end markets. Other important factors include the share of domestic and imported steel in the total supply; steel-making technology (yield and furnace mix); material uses as well as the performance of steel mills located within the Great Lakes/St. Lawrence region.

In addition to these demand factors, the size of iron ore movements depends on supply conditions and competition from alternative routes and modes (discussed in Chapter 2). The latter factor will depend upon the efficiency of the waterway, and is reflected in total transportation charges. Nevertheless, the impact of this cost is usually diluted by the vertical integration in the production, distribution and consumption of iron ore, a characteristic of this industry.

**Iron Ore Receipts by Route**

| U.S. | 1978 | 1982 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|
| | (Percentage) | | | | |
| Quebec-Labrador via Seaway | 9.5 | 9.9 | 7.1 | 7.9 | 6.8 |
| Quebec-Labrador via Atlantic | 4.5 | 7.8 | 7.8 | 5.7 | 5.4 |
| Mesabi via Great Lakes | 61.5 | 64.9 | 68.2 | 71.9 | 71.9 |
| Foreign via Atlantic & Gulf | 13.5 | 10.2 | 13.8 | 13.4 | 14.2 |
| All Other Routes | 11.0 | 7.2 | 3.1 | 1.1 | 1.7 |

| CANADA | 1978 | 1982 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|
| | (Percentage) | | | | |
| Quebec-Labrador via Seaway | 15.2 | 23.6 | 29.7 | 32.8 | 38.8 |
| Canadian Great Lakes | 36.3 | 23.3 | 23.5 | 23.3 | 20.6 |
| Mesabi via Great Lakes | 9.8 | 28.2 | 26.2 | 28.5 | 23.5 |
| All Other Routes | 38.7 | 24.9 | 20.6 | 15.4 | 17.1 |

Source: Based on data from the American Iron Ore Association and the St. Lawrence Seaway Traffic Report.

In addition to the competition between Great Lakes/St Lawrence flows, Quebec-Labrador ore is also transported by ocean vessel to U.S. Atlantic ports and then by rail to the Pittsburgh-Johnstown-Youngstown area, and South American ore shipped by ocean vessel to U.S. Gulf and Atlantic ports[16], and to destination by rail.

Traditionally, the volume of iron ore moved through the Great Lakes/St Lawrence has been second in importance only to grain traffic. On the MLO, volume increased from 5.6 million tonnes in 1959 to a record 20.2 million tonnes in 1977 as a result of labour disputes in the U.S. Mesabi mines. Subsequently, this traffic gradually declined reaching a low of 7.4 million tonnes in 1982. This, the lowest level since 1963, was related to the prolonged economic recession which depressed the automotive and steel industries in North America.

**Iron Ore Traffic Through the Great Lakes/St.Lawrence Seaway**

(Million Tonnes)

| | 1959 | 1977 | 1987 | 1988 |
|---|---|---|---|---|
| MLO Section | 5.6 | 20.2 | 9.6 | 10.8 |
| Welland Canal Section | 6.3 | 19.9 | 6.2 | 7.1 |
| Great Lakes | 52.3 | 68.1 | 56.0 | 61.9 |

Source: Based on data from the St. Lawrence Seaway Traffic report and Lake Carriers' Association

In 1986, iron ore traffic on the MLO was 8 million tonnes; while, on the Welland, it reached the lowest level ever at 5.8 million tonnes. During the last two years, however, iron ore traffic through the Great Lakes/St Lawrence recuperated slightly reaching 10.8 million tonnes and 7.1 million tonnes on the MLO and Welland canal respectively in 1988. This resulted from improved performance of the Canadian steel industry, particularly in Hamilton, coupled with the moderate success of the U.S. administration in limiting foreign steel imports to about 20% of total steel consumption.

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[16] South American ore also moves through the St Lawrence. However, the origin gives other routings a relative advantage with respect to this supply.

## COAL

Most coal carried on the Great Lakes/St Lawrence is destined within the Lakes either from U.S. Great Lakes ports or from Thunder Bay. The table below summarizes flows through Canadian ports. Predominantly, this traffic is destined either for Ontario Hydro or for Canadian steel mills. Most of this coal is first shipped by rail from Appalachian mines to Lake Erie ports for transfer to lakers. Ontario Hydro operates one coal-fired station and one dual coal/gas-fired station. Cement plants and other users on Lake Ontario and the St Lawrence account for a smaller amount of coal traffic on the waterway.

### Coal to/from Ontario Ports, 1987

(Thousands of Tonnes)

**Origins**

| **Destinations** | U.S. Lake Erie Ports | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ashtabula | Conneaut | Toledo | Sandusky | Other U.S. Upper Lakes | Thunder Bay | TOTAL |
| Lake Ontario | | | | | | | |
| Clarkson | 25.8 | | 191.2 | | | | 217.0 |
| Hamilton | 25.1 | | 1680.8 | 1721.6 | | 53.2 | 3480.7 |
| Lakeview | 677.8 | 500.7 | | | | | 1178.5 |
| Picton | 220.6 | | | | | | 220.6 |
| other | 169.5 | 27.5 | 20.7 | | | | 217.7 |
| Thorold | | | | | 9.1 | | 9.1 |
| Lake Erie | | | | | | | |
| Nanticoke | 1911.3 | 1652.0 | 114.6 | 418.2 | | 2122.0 | 6218.1 |
| Port Stanley | 85.5 | | | 29.1 | | | 114.6 |
| St Clair River | | | | | | | |
| Sarnia | 814.1 | 1156.5 | | | | 29.2 | 1999.8 |
| Courtright | 201.9 | 220.3 | | | | | 422.2 |
| other | 82.8 | 54.2 | | | | | 137.0 |
| Lake Huron | | | 9.0 | | 8.8 | | 17.8 |
| Sault Ste Marie | | | 1547.6 | 18.5 | 18.5 | 132.9 | 1717.5 |
| Lake Superior | 11.6 | | | | 35.7 | | 47.3 |
| other Ontario | | | | | | 6.9 | 6.9 |
| United States | | | | | | | |
| Chicago | | | | | | 213.4 | 213.4 |
| Indiana Harbour | | | | | | 311.6 | 311.6 |
| **TOTAL** | **4226.0** | **3611.2** | **3563.9** | **2187.4** | **72.1** | **2869.2** | **16529.8** |

Coal through the Seaway, itemized below, is a modest percentage of the total. Coal traffic through the Welland Canal grew from 4.4 million tonnes in 1959 to a record level of 9.8 million tonnes during 1969 and 1970. In the years which followed, it gradually decreased reaching a low of 5.5 million tonnes in 1983, rebounding to 6.7 million tonnes in 1984 mainly as a result of a strengthened economy and stock-piling policies. The last two years have seen coal traffic of 5.8 million tonnes.

**Seaway Coal Flows by Ports of Origin and Destination, 1987**

(Million Tonnes)

| | **Port of Destination** | | | | | |
|---|---|---|---|---|---|---|
| **Port of Origin** | Oakville | Picton | Hamilton | Clarkson | All Other | **TOTAL** |
| Thunder Bay | 0 | 0.00 | 0.05 | 0.00 | 0 | 0.06 |
| U.S. Ports | 1.18 | 0.25 | 3.44 | 1.91 | 0.50 | 5.59 |
| **TOTAL** | 1.18 | 0.25 | 3.49 | 1.91 | 0.50 | 5.65 |

Source: Estimated and based on data from Statistics Canada.

During the 1981 navigation season, about 1.6 million tonnes of U.S. thermal coal were exported to Europe via the Great Lakes/St Lawrence. This movement, to the lower St. Lawrence by laker and then transshipped, was caused by two factors; a sudden increase in coal demand as a result of escalating petroleum prices, and an unstable political situation in Poland, (normally a major coal exporter within Europe). Given the temporary labour problems in South Africa and Australia at that time, U.S. coal exports were the only alternative to satisfy the sudden demand. These contributed to congestion problems in the traditional U.S. coal export transportation system and consequently increased demurrage cost, thus justifying movement of some of this coal through the Seaway. With the elimination of most of these factors in recent years, and particularly with falling oil prices, this traffic gradually diminished.

## POTASH

Most of the potash produced in Canada is sold on the export market. Exports increased steadily from 3.2 million tonnes in 1970 to approximately 6.4 million tonnes in 1987. Saskatchewan, the major producing area, exports about 60 percent of its production to the northern part of the U.S. Midwest, and 35 percent to overseas markets through the port of Vancouver. Shipments from Saskatchewan to the port of Vancouver and much of the U.S. market are by rail. It is estimated that transportation costs account for 50 percent of potash price at the U. S. market and 33.3 percent of the price at the port of Vancouver.

Traditionally, all potash carried on the Great Lakes originates in Saskatchewan and is railed to Thunder Bay for furtherance by water. These movements grew from about 0.4 million tonnes in 1979 to almost 2.0 in 1984, but declined to about 1.5 million tonnes in 1988. Major destinations include U.S. Great Lakes ports (Toledo, Burns Harbours and Ashtabula), Canadian Great Lakes ports and overseas destinations, mainly in Europe.

## LIQUID BULK

In 1988, 2.74 million tonnes of liquid bulk traffic used the Seaway. Liquid bulk commodities move in lake or ocean going tankers, and include petroleum products, chemicals, fertilizers and edible oils. Particularly in the case of import chemicals to the United States, some of the movements may have environmental implications. Imports include dangerous goods whose manufacture and handling in the U.S. are controlled. In this regard, pressures to ban tankers from the St Lawrence River are noted.

The largest movement of liquids is within the Great Lakes and St. Lawrence System, primarily among the Lake ports and mostly between U.S. ports. For this traffic the water mode is cheaper and port facilities exist; thus it is not considered to be seriously sensitive to competition from other modes. The one disadvantage is the seasonal shutdown of navigation, although some parts of the System, e.g. Lakes Ontario and

Michigan operate year around. Any shutdown requires planning and facilities for appropriate storage, or the use of rail or highway movement during the winter, the latter considered to be the more expensive alternative.

Ocean going tankers are encouraged to transit the Seaway into the Lakes by the attraction of avoiding transshipment to Lakers or rail, either of which involves the additional cost of moving the cargo through terminal facilities in St. Lawrence ports. Also avoided is the risk of spills during transhipment. At the same time they are discouraged by restrictions on cabotage -- foreign flag vessels transporting cargo between Canadian ports. Generally, outbound loads for these tankers come from St. Lawrence ports, not from the Lakes, so an empty movement of up to five days through the Seaway is usual. (It has been noted recently, however, that foreign flags have been securing cargoes of export petroleum products from Sarnia.)

## Petroleum Products

Crude petroleum comes into St. Romuald from overseas by tanker and to Montreal by pipeline from Portland, Maine. Ontario refineries are supplied with crude by pipeline from western Canada. Petroleum products, mostly gasoline and fuel oil, move from refineries at Sarnia and Nanticoke, to other ports on Lakes Erie, Huron and Superior, as well as to some Lake Michigan ports such as Chicago. Some also moves down the System to St. Lawrence river ports and, perhaps surprisingly, to north-east U.S. ports in Maine.

A substantial volume of refined petroleum is purchased in the offshore *spot markets* and brought into the lakes, particularly Lake Ontario. For example, Trillium Shipbrokers acts as agent for a number of companies importing offshore petroleum products. Air Canada buys large volumes of jet fuel for both Canadian Airlines International and itself on the Rotterdam spot market. This is shipped directly into Hamilton storage for use at Lester B. Pearson airport. Apparently, there are similar moves on the U.S. side.

Most short and some longer distance moves of petroleum products are by truck, Rail, however, can compete effectively in service and price to major users such as pulp and paper mills, so enjoys a considerable share of traffic, particularly of fuel oil. The costs of transporting petroleum products through the Seaway also are avoided or minimized by "product swapping" between producers to minimize cross transportation of identical commodities. The history of a cycle of tank farm construction, removal, and reconstruction at Hamilton suggests that distribution patterns for petroleum can shift radically according to the global strategies of the multinational oil companies concerned. In this regard, the extent of future traffic, and even the direction of predominant moves, are difficult to predict.

Suncor and Neste O.Y., the national petroleum company of Finland, have a joint venture which uses the ice strengthened vessel Kiisla. This ship has operated year around for 3 years in the lakes carrying BTX (benzene, toluene, xylene) principally from Sarnia to Chicago.

### Inorganic Chemicals

Liquid chemicals, such as calcium chloride and caustic soda also move within the System. Calcium chloride, used for highway maintenance, is shipped into a number of lake and St. Lawrence ports. Caustic soda from Amherstburg is used in the production of pulp and paper, and moves to such widely separated ports as Cornwall and Thunder Bay.

### Edible Oils

Also moving within, into and out of the system are edible oils. For example, Canada Packers at Toronto, imports 50-60,000 tons of vegetable oil annually. This traffic currently is brought into Toronto by salty from overseas origins such as Malaysia. On occasion, Canada Packers buys oil in the United States and brings it in by rail. Cost considerations usually are overshadowed by those relating to product quality. Vessels used for edible oils are parcel tankers with capacity of about 12,000 tonnes. The small vessel is preferred because of the company's concern about potential degradation and loss of product when handled in larger vessels. Toronto is the preferred marine destination because Canada Packers' customers and storage tanks ( including additional customer owned storage) are located there.

Canola oil usually moves by rail from western Canada to storage at Intertank in Quebec City or Montank in Montreal for export. This traffic moves at WGTA rates as far as Thunder Bay and at minimum compensatory rates (slightly above rail variable cost) in eastern Canada. For several years there has been discussion about building a tank farm at Thunder Bay to attract this traffic to the Great Lakes and St. Lawrence System, but there have not yet been any firm developments. Two factors appear to be against the viability of such a project: the parcel tanker, which is the logical vessel for the trade, simply does not go into Lake Superior; and the lack of year around access would limit the economics of a Thunder Bay terminal.

## IRON AND STEEL PRODUCTS

Steel movements on the Seaway have increased over the years to account for 94 percent of the total general cargo traffic on the MLO and 93 percent on the Welland. This traffic is financially important to the Seaway since general cargo is assessed substantially higher tolls than bulk commodities.

Almost 90% of the import iron and steel is from Western Europe and destined for U.S. upper Great Lakes ports. The principal countries of origin are: Belgium, the Netherlands, the United Kingdom, West Germany and Japan. To a much lesser degree, U.S. exports abroad and Canadian imports from overseas (transiting only the MLO section) move through the Great Lakes and St Lawrence. Steel imports via the Great Lakes/St Lawrence to U.S. destinations peaked in 1971 at 5.0 million tonnes. Since that year, tonnage has declined substantially, reflecting the deteriorating situation of the U.S. steel industry coupled with protectionist policies. In 1988, this flow was only 2.5 million tonnes. In contrast, imports to Canada have grown slowly but steadily to the record level of 1.5 million tonnes in 1988.

Almost all of the U.S. steel imports are to the U.S. Great Lakes ports of Chicago, Cleveland, and Detroit. The majority of Canadian steel imports are to Hamilton and Toronto.

Historically, iron and steel traffic through the Montreal to Lake Ontario section (MLO) grew from an estimated 0.4 million tonnes in 1959, to the record high of 5.6 million tonnes in 1971. During the following years, this movement fluctuated sharply. However, in 1988 volume was 4.3 million tonnes. Iron and steel traffic on the Welland in 1959 was about 0.3 million tonnes. This traffic peaked in 1971 at 5.4 million tonnes and, after several sharp fluctuations, settled at 3.0 million tonnes in 1988. The importance of this commodity group in 1988 was 10.6% and 7% on the MLO and Welland respectively.

Some steel slabs move from overseas (this year from Brazil) to the major Canadian producers at Hamilton to supplement supplies during periods of temporary production interruptions or excess demand. Steel traffic relates to rolling mill capacity, and periodic lengthy shutdowns of blast furnaces for relining. The world steel market is volatile, and import/export balances are very unstable. A world market for steel with rapidly shifting flows is expected for some years to come. All this traffic moves, and is expected to continue to move, in foreign flag ships. This shipping competes with Canadian and U.S. rail (mostly U.S.) which is the dominant mode.

Exports via the Lakes from the Canadian producers at Hamilton and Sault Ste. Marie, either to the U.S. or overseas, can be significant. Export steel for overseas destinations is sold F.O.B. mill. Transportation is arranged by agents in the U.S. Some of this traffic moves direct by foreign flag ocean shipping, but the major competition is rail to U.S. east coast ports. Voluntary restraints in the export of steel and steel products to the U.S. are expected to continue for at least another two years, after which there may be some expansion of this traffic. Currently, exports from Canada to the U.S. are moving by highway, and unless unforeseen service problems develop, there is no reason to expect this to change.

The acquisition of Algoma Steel at Sault Ste. Marie by Dofasco is expected to result in some changes in shipping patterns affecting the Great Lakes and St. Lawrence System. Dofasco's offshore exports of steel are expected to increase to as much as a million tonnes per year. This traffic could use the Seaway, but rail movements to the ports of Montreal or Saint John, or through the U.S., are alternatives. "Interplant" traffic between Algoma and Dofasco is developing and could move by water. However, the shallow draft of the channel serving Algoma's plant at Sault Ste. Marie precludes the use of the larger most efficient Seaway sized vessels. This traffic is now carried by rail. Some bulk steel moves overseas to Eastern Mediterranean destinations from Contrecoeur.

## OTHER TRAFFIC

Commodities which move through the Great Lakes and St. Lawrence System and/or across the Lakes include construction materials, salt and forest products.

## Construction Materials

Crushed limestone is transported among Lake Erie and Lake Ontario ports. This commodity is used in concrete and for highway construction. There is a shortage of aggregate in southern Ontario and much is moved from Manitoulin Island and various ports on the U.S. side of the lakes. With plans for highway construction and reconstruction in southern Ontario calling for more than $ 1 billion, and with substantial continuing industrial commercial and residential construction, major growth in such traffic is a reasonable expectation.

Aggregate causes considerable wear/damage to the vessels that carry it and, at current rates, is not more than marginally profitable to Great Lakes carriers. It is not clear from where and how future supplies of this material will be delivered. However, as local and nearer sources are depleted, it seems that larger quantities must come from greater distances at more profitable rates. In this regard, the Seaway could prove of exceptional importance to the continued development of southern Ontario.

There is some cement traffic from Lake Erie and Lake Ontario ports moving primarily to U.S. ports in the upper lakes. Gypsum moves from mines in the Atlantic Provinces to major ports on the St. Lawrence and Lake Ontario, including Quebec City, Montreal, Kingston, Toronto and Hamilton.

## Salt.

A commodity with handling characteristics similar to aggregate (less abrasive but more corrosive) is salt used on roads during the winter, and by the meat packing industry. This traffic moves from Windsor and Goderich to St. Lawrence river ports, notably Montreal, Contrecoeur and Quebec as well as to Lake Ontario and upper lakes ports. Considerable volumes originating in the Atlantic Provinces (notably Pugwash) and Quebec (Grindstone), are delivered to lower St. Lawrence ports.

## Forest Products

Only a small volume of forest products is currently moving or has recently moved on the Great Lakes and St. Lawrence System. One example is newsprint from Abitibi Price at Thunder Bay to Toledo. Another is lumber from the lakehead and north-western Ontario to destinations around the lakes in the United States. Some of this traffic is transshipped from rail or truck to water at Thunder Bay.

Newsprint is very sensitive to transit time and year around reliability, and to rail and highway competition. The movement of newsprint requires careful handling because, despite its bulk, it is a very fragile commodity. The railways use specially designed box cars assigned exclusively to this commodity. A carload of newsprint is provided with special handling in classification yards to avoid crushing the core of the roll. Highway transport, generally, does not have to concern itself with damage in transit to the same extent as rail. Newsprint is also very sensitive to moisture content for both running on high speed presses and for ink absorption. Accordingly, newspapers like to have an assured supply on hand in temperature and humidity controlled warehouses. For the foreseeable future, significant newsprint movements on the Lakes should not be expected.

Apparently the Port of Thunder Bay is developing a movement of lumber direct to offshore destinations. This new traffic is to be stimulated by incentive tolls initiated by the St. Lawrence Seaway Authority. The incentives have the effect of giving lumber the advantage of lower bulk commodity rates. Should this venture prove successful, volumes will be modest relative to bulk products.

### *Review of Forecasting*

The following table compares forecast figures for the Great Lakes\St. Lawrence traffic in the year 2000. These estimates are based on the SLSA and Acres/DRI traffic forecast studies from 1984 (updated in 1986) and 1982 respectively. The 1986 SLSA forecast to 2000 ranged from 20% to 45% lower than the Acres/DRI estimates of 80 and 90 million tonnes for the Montreal to Lake Ontario and the Welland Canal segments of the Seaway respectively.

Now, four more years later, responsible and knowledgeable persons are talking of figures that are much lower again. Canadian domestic grain shipments as low as 2 million tonnes annually are believed a realistic possibility. Predictions of grain flows insufficient to balance upbound iron ore are popular. It is clear that, as the Acres/DRI prediction was the product of extrapolating the upward trends in evidence at that time, current pessimism relates analogously to the experience of recent years.

It is important to recognize that the extrapolation of intermediate term trends is the state of the long term forecasting art as currently practised. However, while noting that no forecasts were developed[17] during the study reported here, it is observed that current pessimism could prove as unfounded as the optimism of 1982. The volatility of world trade, and particularly the political structure that underlies it, suggests that credible scenarios could exhibit much greater variability than would have been envisaged a few years, or even months, ago.

The policy maker, interested in the future of Great Lakes commerce, would seem to have two reasonable alternatives:

> presume that the future of the System is subject to so many variables as to be unpredictable, but recognize the intense volatility of the situation and the effect that this must have on all affected parties, particularly shippers and carriers;

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[17] A schedule of material developed during the study with respect to the forecasting of demand for St Lawrence Seaway transportation is included in Appendix B.

take a fundamentally new analytical approach to predicting future demand for Great Lakes/St Lawrence transportation.

It would be possible to adopt the first option as an interim measure, and to also pursue the second. Regardless, comprehension of the degree of uncertainty that prevails is crucial to understanding the present behaviour of industry and government agencies involved with the System.

### *Importance to Ontario*

All industries utilizing Great Lakes/St Lawrence transportation are justified in claiming that the system is highly important to them. Regardless of transportation and production adjustments that may be available, they have organized their operations around and invested in the marine mode of transport. Even industries not currently using the mode can claim its importance on the basis of the benefits its existence as an alternative bestows in negotiating power and contingency planning. Although difficult to measure, such benefits are real.

## GRAIN HANDLING

Two major industries, however, seem threatened to the extent of priority policy concern on the part of the Province of Ontario.[18] Of these, the vulnerability of Ontario's export grain handling industry, and its local impact particularly in Thunder Bay, are well known. The effects are also readily assessed; economic impacts of reduced grain flows do not depend on the cause of the reduction.

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[18] Initially, Ontario Hydro also comes to mind. However, the movements concerned are primarily restricted to the Upper Lakes. A serious threat in terms of disintegration or closure of the industry that serves it, or the necessary infrastructure, is not envisaged, and the consequences of such an event are readily assessed.

## STEEL

Less well known, and more difficult to assess, are the impacts of reduced and erratic grain flows through the Lakes on the viability of the Canadian Great Lakes shipping industry, on the iron ore traffic that moves as backhaul to the grain, and on Ontario's steel industry in general. The steel industry and the industrial activities that depend on it are orders of magnitude more important to the provincial economy than is export grain.

It is difficult to overstate the importance of the iron and steel industry to Ontario. Its future depends on Great Lakes/St Lawrence transportation. Iron ore and coal are major movements on the Seaway (iron ore was over 25% of traffic on the MLO in 1987 while coal was about 12% of Welland traffic) as well as within the upper lakes. Even with the importance to the Seaway, the manufacturing industry dependent upon these materials is of much greater importance to Ontario.

The steel industry is strategically located on the lakes to benefit from cheap marine transport of raw materials. The Ontario (and Canadian) steel industry is also located within its major consuming region. The continued economic viability, and retention in Ontario, of much of the consuming industries, particularly automotive, hinge on the success of the steel industry. The following table illustrates the economic importance of steel.

**Primary Iron and Steel, Canada and Ontario**

| Year | Value of Shipments<br>Canada<br>$ millions | <br>Ontario | Employment<br>Canada | <br>Ontario |
|---|---|---|---|---|
| 1989 | 8,670 | 6,936 | n.a. | n.a. |
| 1988 | 8,771 | 7,017 | n.a. | n.a. |
| 1987 | 8,257 | 6,606 | 35,383 | 28,306 |
| 1986 | 7,754 | 6,194 | 35,193 | 28,154 |

Source: Statistics Canada

Note: Value of Shipments for Ontario, 1987 to 1989 are estimated on basis of 80% of Canadian total. Similarly, Employment in Ontario is estimated as 80% of Canadian total.

While a proportion of the value of shipments can be attributed to the extractive and transportation industries, most of the value must be attributed to the manufacturing process that takes place in Ontario. The employment estimates are clearly attributable to Ontario production. Statistics Canada estimates that 40-45% of steel production is consumed by the automobile industry and that a further 25-30% of steel is sold to service centres that further process it and then resell in smaller lots. Both of these industries are largely based in Ontario.

The steel industry is intensively competitive on an international scale and its health hinges on many factors, but reasonably priced raw materials (only assured by water transport) is foremost among them. The potential impact of the loss of export grain traffic on iron ore rates is perhaps the most immediate concern. Information received from Dofasco, and unit costs calculated in Chapter 2, indicate that the company's annual iron ore transport bill would be some $70 to $80 million higher without the Seaway. Should coal not be deliverable by water that company's cost would rise by well more that $100 million/year. Algoma is not included in these figures, and Stelco costs would probably be higher than the total. Without economical Seaway transportation it is difficult to see how the Ontario industry could remain competitive internationally.

## AGGREGATE

Another area where the importance of Great Lakes and Welland canal transportation is expected to increase is for the movement of construction aggregate. The depleting nature of this resource dictates that future sources will be more distant and involve increasing transportation. It may not be an overstatement to say that the long term continued development of southern Ontario could depend on import of aggregates, and that the Seaway would be crucial to this effort.

# CHAPTER 2

# CANADIAN GREAT LAKES SHIPPING
# MAJOR BULK PRODUCTS
# COST & SYSTEM COMPETITIVENESS

***This chapter concentrates on route and modal competition by examining the economics of four major bulk commodities moving on the System; grain, iron ore, potash and coal. Alternatives considered are the Mississippi River system, the use of West Coast ports, direct rail by-passing Thunder Bay, and trucking. Also examined is the economics of allowing foreign built vessels, foreign crews and immunity from Canadian taxes for the carriage of iron ore and export grain.***

## *Methodology*

Although there has never been a requirement that rates for water carriage be published, throughout most of the history of the St Lawrence Seaway, rate levels were generally known in the trade, and shippers, competing carriers and policy makers could all view a transparent schedule of rail rates and make decisions accordingly. Most carriers were legally compelled to publish tariffs containing all rates, file them with the appropriate regulatory authority and make the tariffs available for public inspection. While tariffs are available to some extent today, the rates effectively charged are not public. In this regard, a brief outline of events leading up to the present is given in Appendix C.

This relatively recent change has led to an increased emphasis on carrier cost, both in the market and in the present study. While Chapter 1 considered traffic flows, the analysis of the present chapter is an amalgam of rate information, some of it rather fragmented and dated, and estimates of the cost of Great Lakes/St Lawrence transport and of modal and route alternatives.

Rate and cost data must, however, be viewed from broad perspectives. One must allow for the extent to which decisions based on factors other than rates or costs influence the choice of routes and modes. A shipper may prefer a certain route for tradition or loyalty reasons that override short term efficiency and cost effectiveness considerations. Shippers also tend to use several routes and modes to ensure security of movement during unforseen disruptions such as strikes. Also, it is believed that using more than one route or mode fosters competition and keeps the carriers "honest".

## Costing

The main thrust of the analytical methodology is the development of Great Lakes/St Lawrence vessel costs and corresponding costs for direct rail and other alternative routes/modes. For the Great Lakes/St Lawrence, a computerized vessel costing model[1] was used. The model, was designed to estimate the cost of owning and operating vessels in the Canadian Great Lakes/St Lawrence trades. It was extensively modified to produce costs, for 1987, consistent with costing methodology generally applied to other modes, particularly rail.

Railway costs used in this study were developed by the Research and Traffic Group from a variety of public sources. The costs used are measures of *long term variable cost* including such elements as the variable component of the cost of capital of assets employed, system maintenance causally attributable to the traffic, empty return expectations etc. For the purpose of the present study, financial parameters used are compatible with those of the modified Vessel Costing Model.

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[1] The Research and Traffic Group modified the *Great Lakes/St Lawrence Vessel Costing* computer *Model* developed by Chris Dineen and Ray Baldwin of the Research Branch of the Canadian Transport Commission (CTC Research Working Paper 30-87-03). The model structure and data were developed from and after a study by Peter Yee of the Toronto/York Joint Program in transportation under contract to the Commission (*Estimation of Lake Vessel Costs for Canadian Export Grain,* CTC Research Working Paper 30-85-15). The modifications were major, particularly with respect to the treatment of capital costs.

## Rates

Rates for Great Lakes/St Lawrence shipping are not publicly available. In some cases, (particularly the Canadian Wheat Board), relevant information was published; generally, rate information was only available from cooperating industry personnel. Understandably, this was not for publication, but it did serve as a credibility check on conclusions otherwise reached.

To provide some link between the costs as computed and railway prices, comparisons between rail rates within Western Canada were prepared. 1987 was selected as the base year for most of the analysis of this chapter, not because more recent data were never available, but because it is the last year in which the railways were required to publish all freight rates. Since then, rates that effectively move the traffic, especially bulk commodities other than grain, are generally contained in confidential contracts. Only the barest of information is available on these contracts.

## Competing Routes and Modes

The Great Lakes/St Lawrence System competes for traffic with several other modes and routes depending upon the nature of the commodity, the area of origin/destination in North America and the overseas origin/destination. The competing routes and modes selected for cost and rate analysis are:

The Mississippi River System (to Gulf Ports)
Grain Export Through West Coast Ports (via rail)
Direct Rail By-passing Thunder Bay
Trucking

## *General Findings and Conclusions*

*For the Great Lakes/St. Lawrence System (the System) and the Canadian carriers that operate through it, competition currently falls into two categories: systems with different routings from that provided by the System, particularly the Mississippi to the Gulf of Mexico and Pacific export routings out of west coast ports; and modes other than marine providing essentially the same routing, particularly rail to Gulf of St Lawrence ports.*

*The Great Lakes St. Lawrence system does not have strong competitive advantages over the Mississippi system or the westward movement of bulk products to export position. Also, and not widely recognized, in the absence of iron ore backhaul (for those vessels carrying grain where ore backhaul demand is depleted) Great Lakes/St Lawrence shipping has only a marginal cost advantage over the direct rail movement of grain to Montreal or Quebec.*

## *THE MISSISSIPPI*

*At least during periods of low U.S. domestic demand, both river barge carriers and elevator operators offer rates for Canadian grain that are lower than Great Lakes/St Lawrence costs.*

*Diversion of significant grain traffic to this route would affect vessel capacity on the Great Lakes/St Lawrence, the economical carriage of iron ore and the viability of the Ontario steel industry. If the option of moving grain through the Seaway is to be maintained and Canadian capacity retained but idle, the Mississippi route ceases to be a viable option.*

*Canadian potash moves both down and up the Mississippi but these moves are not believed competitive with the Great Lakes.*

## EXPORT GRAIN THROUGH THE WEST COAST

The proportion of Canadian grain exported through the west coast is rising. This is attributed to shifting world grain markets and a relatively expensive eastward terminal and transport system.

The Western Grain Transportation Act provides for a grain transportation cost subsidy structure, restricted to the rail mode, that biases the least cost transportation decision towards the west. Further, elevation and other terminal charges, at Thunder Bay and the Lower St Lawrence are relatively high.

This poses an immediate threat to Ontario's marine industry and the steel industry that depends on it. The Canadian Great Lakes bulker fleet is shrinking; there is still adequate capacity to move current volumes but it would be marginal for volumes of the early 80's. Focused attention by the Province to this issue is recommended.

## DIRECT RAIL TO THE LOWER ST LAWRENCE

Confidential contracting has given the railways an advantage. They now price more selectively. By maintaining high rates to Thunder Bay (and low rates to the east), a railway can seize any competitive traffic it expects to prove profitable.

U.S. east coast ports are competitive with the Seaway, and termination of At and East grain rates would increase the prospect of seasonal direct rail through Thunder Bay to the lower St Lawrence and perhaps Halifax.

### *Export Grain*

*Direct rail, by-passing Thunder Bay, is not competitive with transfer to water at Thunder Bay if iron ore backhaul is available to share vessel costs. Where backhaul is unavailable rail may become competitive, but only if cleaning at Thunder Bay is not required.*

### *Iron Ore*

*The economical supply of Labrador iron ore to the Ontario steel industry depends on the St Lawrence Seaway system, and on grain movements through the system to lower St Lawrence ports. Without balancing grain movement, the cost of iron ore transport would more than double; without the Seaway it would more than treble.*

### *Potash*

*The Great Lakes/St Lawrence transport of Saskatchewan potash to users in Southern Ontario is cheaper than rail. However, although substantial volumes move by water to the U.S., Ontario traffic is dominantly rail.*

*Abolition of the At and East grain rates (which would reduce available empty hopper cars in the Maritimes) and abolition or extension to water of the Maritime Freight Rates Act, would enhance the competitiveness of the Seaway transport of New Brunswick potash. The inventory and terminal investment factors, that have overcome the marine mode's advantage in the movement of Saskatchewan potash to Ontario, warrant study.*

### *Coal*

***Western Canadian and U.S. coal Great Lakes movements to Ontario Hydro and the Ontario based steel companies are not threatened by modal competition. Coal is very sensitive to transportation cost and the marine mode currently has a clear advantage.***

## *TRUCKING*

***The truck mode is not competitive with the cross-Lakes or Seaway bulk transport of major commodities. Trucking is more likely to complement Great Lakes carriage and enhance its competitive position vs the direct rail transport of grain.***

## *CANADIAN CONTENT RESTRICTIONS*

***Foreign built lake bulker vessels would reduce grain and iron ore shipping cost markedly. Elimination of shipping company corporate tax would further increase the savings. Fully deCanadianized shipping, including foreign crews would reduce costs to some 65% of that of the Canadian shipping industry. Of course, at least equal savings could be achieved through introduction of foreign content into (and consequent destruction of) virtually any Canadian service industry.***

***These savings would be at a cost to Ontario in terms of employment and the indirect domestic benefits it generates. There are substantial legislative impediments but, if delivery of export grain is believed at issue, there is a danger that acceptance of foreign shipping into the grain trade (coasting) could occur quickly. It is suggested that this topic warrants Ontario's early attention.***

***The Mississippi River System***

The Mississippi system extends from Minneapolis to New Orleans, a distance of about 1700 miles. It is maintained without user charge by the U.S. Army Corps of Engineers. The total length of the Mississippi and its tributaries is in excess of 8,900 miles. Major tributaries include the Ohio, which services the corn belt and major industrial areas in the North-East and North-Central states, and the Missouri which services the wheat belt.

Recent years have been characterized by considerable surplus barge and tug capacity on the Mississippi system, and consequent low rates. It is a strong competitor to the Great Lakes/St Lawrence with respect to U.S. export grain. Its role as a competitor to the Great Lakes/St Lawrence for the movement of Canadian grain and potash is explored below.

> ***The Mississippi is a potentially competitive routing for export grain. Particularly during periods of low U.S. domestic demand, both river transport and elevation rates lower than Great Lakes/St Lawrence costs are to be expected, and there are no tolls.***
>
> ***Diversion to this route would cause loss of vessel capacity on the Great Lakes/St Lawrence. If (as is likely) to protect the option of moving grain through the Seaway, and to maintain a viable steel industry, Canadian capacity were retained, the Mississippi grain export route would be less attractive.***
>
> ***Saskatchewan potash moves down and New Brunswick potash up the Mississippi but these moves are not believed competitive with the Great Lakes.***

## CANADIAN GRAIN

Three recent studies of possible Canadian grain movement down the Mississippi have explored its comparative advantages including those of cost. These studies, by A. Gemmell of the Research Branch of the Canadian Transport Commission[2], by J.E. Fruin and others from the University of Minnesota[3] and by Pamela M. Miller of the University of Manitoba Transport Institute[4] looked at the potential use of the Mississippi system for the export of Canadian grain. While this is hypothetical at the present because an export permit from the Canadian Wheat Board would be required[5], it may become a real alternative as implementation of the Canada-U.S. Free Trade agreement proceeds.

It can be concluded that the Mississippi is potentially competitive with the St. Lawrence even though some Mississippi costs (estimated below) are optimistic. For example, sampling and weighing are not included. Also, the U.S. terminal charges were quoted during a period of substantial surplus capacity; traffic routed via the Mississippi could experience considerably higher charges. Further, St Lawrence costs include tolls designed to cover Seaway operating costs, while the quoted rates for Canadian grain on the Mississippi, with its many locks and dams maintained by the U.S. Army Corps of Engineers with funds appropriated by Congress, assume free passage. There are no tolls and the only user charge is a tax on fuel.[6]

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[2] Gemmell, A.W., *The Mississippi River Waterway: An Alternative Route for Canadian Grain Exports?*, CTC Research, 1986. This report drew extensively upon a study prepared for CTC Research by Peter Yee of the University of Toronto-York University Joint Program in Transportation and entitled *An Overview of the Mississippi River Transportation System.*

[3] Fruin, J.E., Halbeck, D., and Clark, E., *The Mississippi River Alternative to the St Lawrence Seaway for Canadian Grain Exports*, Presentation to CTRF, 1986.

[4] Miller, Pamela M., *The Economic Potential of U.S. Routes for the Movement of Grain from Western Canada to Export Destinations*, University of Manitoba Transport Institute, Research Bulletin No. 5, January 1989.

[5] At present, the Canadian Wheat Board becomes the owner of all wheat and several other grains upon their delivery to the country elevator. The Board markets these grains and arranges for transportation at least to the port of export.

Caution is indicated, lest Canadian grain be shifted onto the Mississippi, with the inevitable rapid loss of vessel capacity on the Great Lakes/St Lawrence and Canadian control over this important export, and then predicted economies do not persist over the longer term. Exacerbating such a situation, the importance of the Seaway to the steel industry indicates that its (essentially fixed) infrastructure costs would still have to be covered, by subsidy if not by tolls.

Also, since in peak years the Mississippi system might not be able to handle all or most Canadian grain traffic offered, the Great Lakes/St. Lawrence delivery system would have to be maintained. With sufficient grain traffic regularly routed through the Seaway system to ensure the maintenance of adequate capacity, the Mississippi option might still be attractive, but less so than the studies summarized below might suggest.

### Gemmell

Gemmell estimated that the cost per tonne of moving grain from Winnipeg to export position at Baton Rouge would be:

| | | *CDN$* |
|---|---|---|
| *Rail costs(rate) Winnipeg to St. Paul* | *19.45* | |
| *Terminal costs at St. Paul* * | *1.90* | |
| *Barge costs from St. Paul to Baton Rouge* | *21.90* | |
| *Terminal costs at Baton Rouge* ** | *1.90* | *45.15* |

* *includes elevation as needed and outward loading.*

** *includes elevation and outward loading.*

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[6] Fuel used in commercial operations on designated segments of the inland waterways is taxed. The tax is currently $.10/gallon and to rise to $.20/gallon by 1995. It is dedicated to a trust fund; new locks and dam projects are to be funded 50% from the fund and 50% by the U.S. Federal Government.

He further estimated costs using the Seaway route as:

| | | CDN$ |
|---|---|---|
| *WGTA rate Winnipeg to Thunder Bay* | *20.74*[1] | |
| *Terminal costs at Thunder Bay** | *5.24* | |
| *Vessel costs from Thunder Bay to Quebec* | *19.77* | |
| *Transfer costs at Quebec*** | *2.40* | *48.15* |

* *includes elevation, outward weighing, inspection, terminal elevator receipt cancellation, and lake shippers' charges. Grain cleaning would add some $2.00 to this figure.*

** *includes elevation, outward weighing, inspection, superintendence, wharfage, and forwarding brokerage charges.*

[1] WGTA rate substituted for rate estimated in the study.

The Thunder Bay terminal charge ($5.24) is 275% of the terminal cost estimate for St Paul ($1.90).[7] While all factors are not comparable, and the grain receives a higher quality of treatment at Thunder Bay than is envisaged for St Paul, the difference remains much more than would be expected.[8]

The total charges of $5.24 shown in the Gemmell report are consistent with the Canadian Wheat Board figures above. Also, while actual charges are not available, it is understood that terminal costs at Duluth would be comparable with those at St. Paul, or about $1.90 per tonne.

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[7] Addition of $2/tonne for cleaning would yield a Thunder Bay charge some 380% of the St Paul quote.

[8] Analyzing 1987 terminal charges at St. Paul and Thunder Bay further:

| | St. Paul | Thunder Bay |
|---|---|---|
| Elevation | $1.90 | $4.31 |
| Weighing, Inspection | n.a. | .74 |
| Lake Shippers Clearance Ass'n. | n.a. | .07 |
| Cancellation of Warehouse Receipts | n.a. | .06 |
| TOTAL | $1.90 | $5.18 |

Sources: St. Paul, Gemmell op. cit.
Thunder Bay, Canadian Wheat Board, Annual Report 1987/1988

## Fruin

The Fruin study concludes that "... a portion of Canadian grain exports, probably 2 to 5 million tons, can be moved at a lower total logistics cost if shipped on the Mississippi River to Gulf of Mexico ports. This is primarily grain that goes out the Seaway."[9]

## Miller

The Miller study tested four rail rate subsidy scenarios[10] for each of four grains, wheat, durum wheat, barley, and rapeseed. It was concluded that, if only the *producer* share of the WGTA rate is paid for Canadian railway transportation, all grain would move via existing Canadian routes. Barge rates on the Mississippi would have to fall below the level of variable costs before that route would be considered.

With the total WGTA rates payable by the shipper, and U.S. rail rates as quoted by the railways, almost 20% of western Canadian grain would move down the Mississippi. Should distance-based U.S. WGTA rates apply (the WGTA formula be extended to the U.S.), almost 50% of western Canadian grain could move through Minneapolis and almost 6% through Portland, Oregon. This is the only scenario in which Vancouver/Prince Rupert's share would amount to less than 50%. Thunder Bay would have a share of slightly less than 3.5%.

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[9] Fruin, J.E., Halbeck, D., and Clark, E., *The Mississippi River Alternative to the St Lawrence Seaway for Canadian Grain Exports*, Presentation to CTRF, 1986.

[10] 1. Producer share WGTA rail rates in Canada and U.S. rail rates as provided by CN Rail, CP Rail and Burlington Northern Railroad.

2. Producer share WGTA rail rates in Canada and distance-based WGTA rates in the U.S.

3. Total WGTA rail rates in Canada and U.S. rail rates as provided by CN, CP and BN.

4. Total WGTA rail rates in Canada and distance-based U.S. WGTA rates.

Several other factors, that would enter into any consideration of moving Canadian grain via the Mississippi route, are:

1. Terminal elevators in the United States have limited and less sophisticated cleaning capability. Grain would have to be cleaned on the prairies prior to movement to the U.S.[11]

2. Canadian grain, because of its higher standard, would have to be kept segregated from U.S. grain and therefore shipped in volume. This suggests fewer but larger loading points on the Canadian prairies.

3. Canadian grain would have to be inspected at the U.S. port. This would require either an agreement that the U.S. Federal Grain Inspection Service would inspect the grain or Canadian Grain Commission inspectors would have to be stationed there.

4. Canadian grain would probably have to move in bond to ensure it did not leak into the U.S. market.

5. Since grain moves largely in non-railway owned hopper cars restricted to movement between Thunder Bay and the west coast, some arrangement to allow these cars into the United States (and for their return) would be necessary.

## POTASH

In addition to grain, Canadian potash also travels on the Mississippi river system. Interestingly, this traffic originates in both Saskatchewan, where most of Canada's potash is mined, and in New Brunswick.

Some Saskatchewan potash is trucked across the border to a Burlington Northern rail loading facility[12]. Much of this potash is railed to U.S. consumers with the balance railed to Minneapolis for transfer to barges. The potash transferred at Minneapolis is barged either to U.S. consumers or to New Orleans for offshore export with Brazil being the major market. Both truck/rail and the truck/rail/barge moves to U.S. consuming regions are competitive with direct rail service from the mine in Saskatchewan. The Great Lakes are not competitive; nor is the movement to Brazil at the expense of exports via Thunder Bay. Reference to Statistics Canada data on International Seaborne Commerce shows that most Saskatchewan originated potash bound for Brazil, and indeed for all of South America, is serviced from Vancouver, not from the Great Lakes/St. Lawrence System.

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[11] It is understood that the Saskatchewan Wheat pool recently received a grant from the Western Diversification Office towards a study of inland (prairie) grain cleaning.

[12] This became possible because of Saskatchewan Government assistance in defeating the existing rail rate structure by building a highway capable of handling heavy loads to the U.S. border.

Although Saskatchewan potash should, like grain, be easy to export through the Great Lakes/St Lawrence System, the impediment is believed to be Brazilian (and other South American) insistence on cargo reservation (using their own or an allied country's, flag vessels). South American registered vessels are available at the west coast, the Gulf of Mexico and the east coast, but not usually at Thunder Bay. Waiting for a Brazilian flag to arrive at Thunder Bay would often lead to long and expensive delays.

In the Brazilian and neighbouring markets, New Brunswick producers, Potash Co. of America and Dennison Potacan Potash Co. hold advantages in transportation[13] over any other North American producer marketing on the east coast of the Americas. New Brunswick potash is mined in the Sussex area and is mostly railed to Saint John and then shipped overseas or to U.S. Atlantic Coast ports. Brazil is a major market.

The shipments to U.S. Atlantic Coast ports are probably for subsequent rail movement to the Carolinas and certain corn belt states. In addition, some potash is moved from Saint John to New Orleans then (as backhaul on coal barges) by the Mississippi to these same

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[13] Ocean carriage in nautical miles necessary to access Brazilian markets from North America is:

| | Port of Origin | | | | |
|---|---|---|---|---|---|
| **Brazilian Destination** | **Saint John** | **New Orleans** | **Galveston** | **Thunder Bay** | **Vancouver** |
| **Belem (Paramaraibo)** | 3004 | 3136 | 3410 | 4745 | 6421 |
| **Recife** | 3671 | 4030 | 4218 | 5323 | 7487 |
| **Rio de Janeiro** | 4744 | 5103 | 5340 | 6403 | 8345 |

corn belt states. The current rates ex Saint John to New Orleans are stated to be in the range of US$12 per tonne, and northbound barge rates US$6 per tonne, including transshipping. Each barge carries about 1,500 tonnes, is covered and can provide segregated storage for different grades of potash. A US$ 25 per tonne transport advantage over the Saskatchewan shipper is claimed.[14]

Also using the Mississippi, but not involving traffic for which the Great Lakes/St Lawrence would be logical, CANPOTEX, the export marketing arm of the Saskatchewan mines ships through the Gulf to small markets located in the Caribbean and to northern Brazil. The quantities concerned, 3,000 to 7,000 tonne lots, would not be economical if served out of the west coast with Panamax bulkers carrying 60,000 tonnes.

## West Coast Ports: Grain

> ***The trend of Canadian export grain movement away from the Great Lakes/St Lawrence to the west coast is the greatest threat to the Canadian shipping industry. This is attributable to shifting world grain markets and a delivery system through Ontario and Quebec that is, in the eyes of the shipper, too expensive.***
>
> ***The Western Grain Transportation Act provides for a grain transportation cost subsidy structure, restricted to the rail mode, that biases the appearance of least cost transportation towards the west. Also, it has the effect of causing the cost of the Great Lakes/Seaway leg of the journey to appear disproportionately large.***

---

[14] This would appear reasonable; trainload rail rates from Potash Corporation of Saskatchewan origins for 1987 were:

| | | |
|---|---|---|
| To: | Thunder Bay | $39.66/ton |
| To: | Minneapolis | $35.83/ton |
| To: | East St. Louis | $44.69/ton |

***Further, elevation and other terminal charges, at Thunder Bay and the Lower St Lawrence terminal elevators are large relative to rates charged on the west coast (for a single elevation) and to rates charged for elevation services in the U.S.***

***The threat this poses to Ontario's marine industry and the steel industry that depends on it is immediate. The grain fleet has shrunk to a level were movement of the volumes of the early 80's would be difficult. Attention by the Province to this issue is recommended.***

The west coast competes with the Great Lakes/St Lawrence particularly for export grain traffic. In recent years, the proportion of Canadian grain exported through west coast ports has risen sharply. The statistics below, illustrating this shift, should be viewed bearing in mind that some of the Ontario bound traffic is for the domestic market.

**Rail Movements of Statutory Grain to Ontario and British Columbia 1970-1988**

| | To Ontario | | To British Columbia | | Total |
|---|---|---|---|---|---|
| | 000 Tons | % of Total | 000 Tons | % of Total | 000 Tons |
| 1988 | 12,869 | 40.4 | 18,952 | 59.6 | 31,821 |
| 1987 | 17,828 | 47.1 | 20,025 | 52.9 | 37,853 |
| 1986 | 14,746 | 50.0 | 14,757 | 50.0 | 29,503 |
| 1985 | 13,708 | 52.2 | 12,636 | 47.8 | 26,440 |
| 1984 | 19,905 | 57.8 | 14,506 | 42.2 | 34,411 |
| 1983 | 20,891 | 60.3 | 13,734 | 39.7 | 34,625 |
| 1982 | 20,421 | 63.3 | 11,816 | 36.7 | 32,237 |
| 1981 | 16,500 | 59.2 | 11,365 | 40.8 | 27,865 |
| 1980 | 17,378 | 65.0 | 9,365 | 35.0 | 26,743 |
| 1975 | 14,503 | 69.3 | 6,418 | 30.7 | 20,921 |
| 1970 | 14,040 | 69.2 | 6,254 | 30.8 | 20,294 |

Source: Commodity Flow Analysis - Canadian Carload All-Rail Traffic, Canadian Transport Commission, Traffic and Tariffs Branch, various years.

The predominant reasons cited for the above trend are: the higher cost of moving grain through the Great Lakes/St. Lawrence System, and a shift away from European markets towards the Pacific rim.

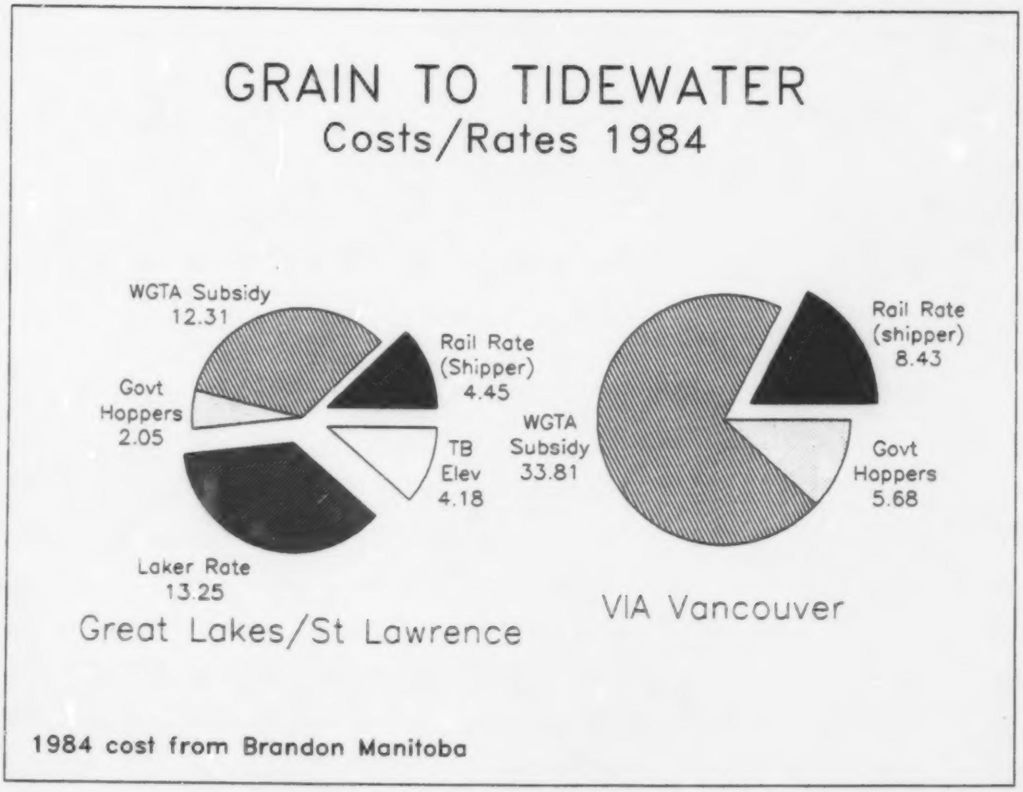
## GREAT/LAKES ST LAWRENCE ROUTING COST

Factors cited for high Great Lakes/St Lawrence cost relative to export through the west coast ports include: (1) the subsidy structure provided under the Western Grain Transportation Act, (2) high contract rates negotiated by the Canadian Wheat Board with Great Lakes carriers, and (3) high elevation charges on the St. Lawrence.

### (1) Western Grain Transportation Act

A 1988 study by the Research and Traffic Group for Transport Canada entitled *Conceptual Development of a Great Lakes Policy Analysis Tool-Grain Rate Module* estimated that rates from Prairie points to Thunder Bay would fall and rates to west cost ports would rise if a cost based rail rate scale was introduced for statutory grain movements. Even more importantly, if the shipper paid the total cost of moving grain to tidewater, he would find the Great Lakes/St Lawrence option much more attractive than it is (to him) under the present subsidy regime. This is illustrated below (over).

The pie at the left, representing the costs of the Great Lakes/St Lawrence routing, is much smaller than that representing total costs for a Vancouver routing. However, if only costs paid by the shipper (represented by *separated* sections of the pies) are considered, Vancouver is much more attractive, even for Manitoba origin grain. The WGTA subsidy and the governments provided railway hopper cars make a much larger contribution when the longer and more costly westerly rail routing is selected. On the other hand, the incremental cost of elevation at Thunder Bay[15] and the costs of Great Lakes/St Lawrence shipping are not subsidized.



Wheat Board officials confirmed that when calculating transport costs, they use the shipper portion of the WGTA rate (the black slices of the pies), since this is what they pay. Furthermore, since it is so low, they can *cross haul* grain as necessary with little impact on the net return to the farmer[16]. It was pointed out by several participants in the grain trade that the dividing line between east and west on this basis is around Kenora, Ontario, considerably east of the easternmost grain farm. By this analysis, all grain would move out via west coast ports did not capacity constraints preclude this. If the WGTA subsidy mechanism were changed, presumably to "Pay the producer," Board officials would then also consider the *WGTA Subsidy* slices of pie and shift their dividing line west[17]

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[15] As an illustrative estimate, the Wheat Board's 1987 figure of $5.18, less $1.00, is used.

[16] The Wheat Board's policy is understandable given its political circumstances. However, the full impact of producer AND government portions falls indirectly on the farmer, or rather the collectivity of farmers. Certain "one time" grants excepted, the government portion is a fixed annual sum. The producer rate is essentially a proration of total (long run variable) cost + authorized railway markup - the fixed sum government portion (Crow Benefit). Of course, each individual farmer, being

The 1988 Research and Traffic Group study developed a cost-based *pseudo rate scale* from the total rate (shipper and government portions). Also included was the economic cost of government provided covered hopper cars.

**1984 Calendar Year Rates**

| From/To | Thunder Bay | | West Coast | |
|---|---|---|---|---|
| | WGTA SCALE | PSEUDO RATES | WGTA SCALE | PSEUDO RATES |
| Winnipeg | 16.67 | 15.41 | 38.75 | 50.45 |
| Brandon | 19.12 | 18.80 | 36.19 | 47.91 |

If these "pseudo" rates were updated to the 1986 level (that used in the study by Gemmell) by applying the escalation factors contained in the CTC grain rate orders, the cost based rate to Thunder Bay would be $18.12 from Winnipeg and $22.11 from

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small relative to the totality, benefits when his transportation cost is minimized on the basis of the 'producer portion' alone. Payoff from careful study of this enigma and effective communication of a more cost effective alternative could be large.

[17] According to Wheat Board officials, this would not increase shipments through Thunder Bay beyond recent levels since they ship considerable amounts of Saskatchewan grain through that port now even though, to their accounting, it would be cheaper to ship via the west coast. They believe, however, that it would make it uneconomic to cross haul grain. It remains to be seen how inclusion of all the information of the pie chart above, including the cost of government provided hopper cars, would shift their dividing line.

Brandon. This is well below the grain rail rates cited in the Mississippi section of this study.

## (2) Great Lakes Rates

Looking back at the Costs/Rates pie charts, and from the perspective of the Wheat Board only considering the separated segments of the charts, the *Laker Rate* is clearly the largest element. Without the government's portion, the rail rate is modest in comparison. It is easy to comprehend a perception that the rates negotiated by the Board with Great Lakes carriers are excessive, and to understand the deeply held conviction that the Board should refrain from any long term contracting in the future. However, the following assessment indicates that the marine rates are, from the perspective of cost and return to the carrier, not excessive. They appear insufficient to maintain the industry over the longer term.

Averages paid by the Wheat Board for Thunder Bay to the lower St Lawrence were:

| | |
|---|---|
| 1984 | $13.25/tonne |
| 1985 | $15.11/tonne |
| 1986 | $13.59/tonne |
| 1987 | $12.14/tonne |
| 1988 | $13.17/tonne |

Vessel costs (1987) were developed, using the *Vessel Costing Model* discussed above, to generate sufficient revenue to cover operating costs, pay 10% interest on borrowed funds, and provide a 15% return on equity capital:

| | |
|---|---|
| Thunder Bay to Quebec City with iron ore backhaul[18] from Sept Iles to Hamilton | $13.09/tonne |
| Thunder Bay to Montreal with empty backhaul | $16.37/tonne |
| Thunder Bay to Port Cartier with iron ore backhaul from Port Cartier to Hamilton | $15.45/tonne |

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[18] The model assumes that iron ore pays the same rates as grain, but prorated according to the time devoted to the ore carriage.

These figures assume continuous operation, over a 260 day season, without any idle period even, as is customary, in mid summer. Significantly, they also assume provision of new vessel capacity to maintain a bulker fleet. As is apparent from study of the Vessel output of Appendix X, *fading out of business* minimum rates are considerably lower. Presuming no interest or return on equity at all, imbalanced iron ore backhaul and 75% vessel utilization, a 1987 rate of $11.00 to $12.00[19] would seem the effective floor. The CWB negotiators have struck a contract that places the carriers in a long term *fading out* posture while they remain willing to provide service so long as their vessels do not require major renovation or replacement. This seems consistent with the Board's vision of future grain routing; it could also serve to eventually prompt cheaper Great Lakes/St Lawrence grain transportation than can be achieved with Canadian built, flagged and manned shipping.

### (3) Elevation Charges

The pie chart illustration shows an incremental elevation charge at Thunder Bay of some $4.18; even from this perspective it is substantial. The Wheat Board reported figure of $5.18 for elevation cost including weighing, inspection and paper handling charges has been compared with a $1.90 quote for handling it through the Mississippi. Also to be considered is the approximately $2.00 charge for cleaning and $4.00 more for the Gulf of St Lawrence elevation and handling. The total, without cleaning, of some $9.00, indeed, warrants the Wheat Board's concern.

The cost figures, necessary to a determination of whether the above charges are reasonable, and to a search for explanation of the discrepancy between the Canadian and U.S. figures, remain confidential to the industry. However, industry persons suggested that the terminal charges served to cross-subsidize the country elevators

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[19] This cost is slightly more modest than a 1986 estimate (Acres International Ltd., *Rate and Costing Analysis of Vessel Operations on the St. Lawrence Seaway*, April 1986) of approximately $9/tonne assuming 100% utilization and not including cargo tolls. A 1987 estimate (*The Seaway Transportation Costs Study - Phase I - The Canadian Grain Transportation Rates*, St. Lawrence Seaway Authority, May 1987) of $20/tonne including capital is also consistent.

(where the competition for grain occurs). This gives rise to a serious concern with respect to the *east vs west* balance; grain exported through the west coast passes through a single terminal elevation; grain exported through the Great Lakes/St Lawrence is subjected to two elevation charges.

## MARKET SHIFT

Markets for Canadian grain have shifted. Chapter 1 includes a description of the shift in markets from Europe (normally served from the Great Lakes/St. Lawrence) to the Pacific rim and third world countries (normally served from the west coast). Grain industry persons have contended that there is a price advantage when selling grain over the west coast. Data are not readily available, but two schools of thought are apparent. The first is that there is a considerable price spread. The second holds that the spread is illusory, and is based on excluding certain cost components when selling over the west coast.

Discussions with the Canadian Wheat Board (CWB) and other members of the grain trade indicated that, in addition to the difference in selling value between grades and grains, there is a difference in how the grains are sold, generally by market. For example, Japan, Malaysia, Indonesia and the Soviet Union pay cash; China buys on credit. The CWB sells on the most advantageous terms it can negotiate at the time. Thus, terms of sale, including the f.o.b. point, can vary, especially on movements to Asia.[20]

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[20] There is some scepticism in the grain trade that the CWB maximizes return to the farmers since many of the costs associated with the transportation and marketing of grain are pooled and distributed evenly across all producers. This is credible but the CWB's perspective understandable; its overwhelming objective is to sell Canada's grain. Parables and proverbs on this topic abound, probably equally balanced for and against the CWB's approach.

## URGENCY

Although a consensus, that the WGTA will eventually be changed in a way that eliminates or reduces the westward bias, the situation seems urgent. West coast capacity could be further expanded, perhaps with an elevator at Roberts Bank. Such a development, with present Wheat Board cost calculations, would undoubtedly increase movements by the west coast at the expense of the Great Lakes/St. Lawrence System. A further complication on this theme would have a major U.S. based company, such as Louis Dreyfus, build the elevator. It would only handle one or two grades of grain leaving the other elevators to handle the multiplicity of grains to be exported, and at considerably greater cost. Most importantly, should expanded west coast capacity be established and the capability of the Great Lakes routing allowed to atrophy, WGTA adjustment might be too late.

The above discussion is believed to summarize the state of current understanding of the threat posed to grain movements through the Great Lakes/St Lawrence, at least beyond the confines of federal and industry specialists. One specific knowledge gap is particularly conspicuous; the role of ocean rates in the equation. This is believed to be the major target of the *Great Lakes Policy Analysis Tool* that is a major development project of Transport Canada's Marine Policy Directorate, and of which Ontario has been informed. With or without the results of this research a document, that summarized global distribution costs for Canadian grain and their relationship to export grain marketing and the structure and regulation of the Canadian export grain industry, seems a prerequisite to effective Ontario representation on behalf of its Great Lakes/St Lawrence industry.

## GREAT LAKES BULKER FLEET

Although the supply of Canadian registered self-unloaders, suited to the movement of coal and other granular cargo, has shrunk somewhat from its high in the early 1980's, there is little concern that adequate capacity will not be forthcoming. The age distribution of the vessels is generally reasonably evenly distributed between virtually new and approximately 25 years, with only a few vessels older. The recent reduction in Canadian capacity is due to *flagging-out* rather than any loss in real capacity. In contrast, the bulker fleet that moves export grain out of Thunder Bay (and iron ore to Ontario and U.S. mills) has been aging and shrinking. With the exception of 9 bulk carriers built (one per year) between 1977 and 1985, the total fleet exceeds 20 years of age. The number of vessels has shrunk from 95 in 1978 to 65 in 1985, 56 in 1988 and 50 in 1989[21]. Available tonnage (DWT) has dropped 120,000 tons over the last year.

Should a surge of grain traffic eventuate, capacity might be strained. However, the analysis of this problem would be complex. Self-unloaders could be converted for bulk carriage if they are available and the rates to be earned attractive. Even in 1988, a low demand year, self unloaders (not converted) moved 5% of the grain. Then, there is capacity that may be gained by improving turn around. Clearly, however, if the bulker fleet continues to atrophy, the industry's ability to deliver will diminish. In this regard, it is noted that more than small inefficient vessels are disappearing; maximum Seaway sized vessels, approximately 30 years of age, are being retired without replacement.

To place the issue in perspective, in 1988 13.2 million tonnes of grain were moved by Canadian shipping, but only 8.3 million from Thunder Bay and 1.1 million from Duluth were moved to and through the Lower St Lawrence. The remainder encompasses a variety of movements, of shorter distance. There is still capacity available. The number of trips a vessel can achieve in a season depends on the Lower St Lawrence terminal served, delays, backhaul movements, the navigation season and (to a lesser extent) vessel speed; however, an average of 15 cycles from Thunder Bay through Montreal should be achievable. Thus, a Seaway sized bulker should be able to move 400,000 Tonnes in a season. Of the 50 remaining bulk carriers, 38 vessels are in this category. For the present fleet total throughput capacity would amount to 17 million tonnes of equivalent Thunder Bay to Lower St Lawrence grain traffic. From the perspective of movements of the early 80's this would be marginal, but present forecasts for the nineties are much lower. Nonetheless, continuing retirements without replacement will restrict the flexibility to increase grain flows through the Great Lakes/St Lawrence.

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[21] Figure derived from Greenwood's *Guide to Great Lakes Shipping*, 1989.

### *Direct Rail VS Great Lakes and St Lawrence*

> ***Confidential contracting has shifted the competitive advantage towards the railways. Railways are now able to price more selectively and less openly. By maintaining high rates to Thunder Bay, a railway can seize any competitive[22] traffic it chooses, subject only to its internal profit maximization and to market competition.***
>
> ***U.S. east coast ports are competitive with the Seaway for bulk traffic; Halifax and Saint John generally are not. The anticipated termination of At and East grain rates would increase the attractiveness of seasonal direct rail through Thunder Bay to the lower St Lawrence and perhaps Halifax.***

## RAIL RATES

The following table illustrates rates on three commodities from origins in Western Canada to Thunder Bay.

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[22] In this sense, grain the routing of which is controlled by the Wheat Board is not competitive.

## 1987 Rail Rates
## to Thunder Bay, Ontario

| Commodity | Origin | Rate | Unit | Unit Train Yes or No |
|---|---|---|---|---|
| Coal | S.E.-B.C. | 27.50-30.50 | ton | Y |
| Potash | Saskatchewan | 39.66[1] | ton | Y |
| Grain[2] | Calgary | 37.37 | tonne | N |
|  | Saskatoon | 29.96 | tonne | N |
|  | Allan | 29.45[3] | tonne | N |
|  | Zeneta | 25.94[4] | tonne | N |

[1] Includes loading onto vessel
[2] Rates shown comprise combined shipper and government shares and no charge for government supplied hopper cars.
[3] Nearest grain point to potash origin Allan Mines
[4] Nearest grain point to potash origins Cutarm and Yarbo

Source:
1) Coal - CPW 4018B, effective June 30, 1987
2) Potash - CFAW 4100D, effective April 6, 1987
3) Grain - CFAW 4310, effective August 1, 1987

Removal of the vessel loading cost from the potash rates would bring them closer to the coal rates. The coal rates also benefit from larger train size and more restrictive loading and unloading conditions, all factors that permit more flexibility in railway pricing.

The comparison between potash and grain is also interesting. The equipment used is identical, 100 ton covered hoppers. Potash is moved in railway owned equipment while, as stated earlier, the grain moves in equipment owned by other than the railways (essentially by governments), and for which the railways do not have to make any payments. Potash moves in small unit trains while grain moves in carload, and sometimes, multiple carload quantities. Coal and potash are priced on a commercial basis while grain rates are established annually pursuant to the Western Grain Transportation Act at average long run variable cost plus 20%.

Since passage of the National Transportation Act, 1987, the public visibility of railway rates has been severely diminished. Rates that move the traffic, commonly referred to as *effective rates*, are now contained in confidential contracts. These contracts may contain several provisions but most contain either reduced rates or reductions from already existing rates. The net effect is the same, shippers have been receiving a better deal on price since the NTA, 1987 was passed. Analysis[23] suggests that potash shippers engage in confidential railway contracting. The National Transportation Agency, for its *Annual Review 1988*, surveyed shippers and carriers respecting confidential contracts and reported that 75% of shippers with confidential contracts had obtained rates lower than in published tariffs.

The implementation of confidential contracting appears to have shifted competitive advantage in many areas to the railways from the marine industry, especially since

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[23] To determine (within reasonable confidence limits) if shippers of coal and potash are benefitting from confidential contracts, the National Transportation Agency's listing of confidential contract summaries was consulted.

**Confidential Contract Summaries**
**Western Canada to Ontario**

| Railway | Contract Number | Commodity Group | Probable Commodity | Origin Province | Destination Province | Destination Point |
|---|---|---|---|---|---|---|
| CN | 00682A | Coal | Coal | Alberta | Ontario | Thunder Bay |
| CP | BBBB000135 | Coal | Coal | B.C. | Ontario | Thunder Bay |
| CP | BBBB000166 | Coal | Coal | B.C. | Ontario | Thunder Bay |
| CP | BBBB000135 | Coal | Coal | B.C. | Ontario | Thunder Bay |
| CN | 01526 | Chemicals[1] | Potash | Sask. | Ontario | [2] |
| CP | CCCC000118 | Chemicals | Potash | Sask. | Ontario | |
| CP | CCCC000127 | Chemicals | Potash | Sask. | Ontario | |
| CP | CCCC000191 | Chemicals | Potash | Sask. | Ontario | |
| CP | CCCC000195 | Chemicals | Potash | Sask. | Ontario | |
| CP | CCCC000200 | Chemicals | Potash | Sask. | Ontario | |
| CP | CCCC000217 | Chemicals | Potash | Sask. | Ontario | |
| CP | CCCC000253 | Chemicals | Potash | Sask. | Ontario | |
| CP | CCCC000257 | Chemicals | Potash | Sask. | Ontario | |
| CP | CCCC000270 | Chemicals | Potash | Sask. | Ontario | |

[1] The full name for this grouping is Chemicals or Allied Products.

[2] The probable destinations would be Thunder Bay for transfer to marine transport or direct to rail transfer facilities such as Putnam and Ridgetown.

Source: National Transportation Agency.

Coal is relatively easy to identify since most, if not all, coal from Alberta and British Columbia is destined for transfer to marine carriage at Thunder Bay. Potash is much more difficult to identify being lumped into Chemicals or Allied Products. There are, however, only two major chemical movements that would occur from Saskatchewan to Ontario and Quebec, namely salt cake (sodium sulphate) used mainly by the pulp and paper industry, and potash. Contracts that apply to other than Ontario have therefore been excluded. Also, there are several contracts (CP) that identify neither origin nor destination province. Since these can't be attributed to movement between Saskatchewan and Ontario they have been excluded. CP contract CCCC000200 from Saskatchewan to Ontario is a prime example of probable potash traffic since it was in effect from March 1, 1989 to May 31, 1989 and this timing fits closely to peak demand for potash.

marine carriers are dependent upon the railways to deliver traffic from origin to port before they can compete. Railways are now able to price more selectively and less openly. In principle, water transport over long distances is less costly than rail, but by eliminating additional transfer costs at Thunder Bay, by maintaining high rates to Thunder Bay, and by careful costing east of Thunder Bay, the railways could alter the competitive balance in their favour. In a scenario such as this, the railways would restrict Thunder Bay competitiveness to those situations in which market forces dictate such a routing.

## CANADIAN EAST COAST PORTS

Part of the attraction of East Coast ports is their proximity to major traffic lanes. Overseas trade is largely carried in foreign registered bottoms with foreign crews. Seaway navigation especially during cold weather is seen as being unattractive for ocean going vessels which are generally not ice strengthened. Also, crews are generally from Third World countries with little, if any, cold weather experience, especially navigating in icy channels. Salties do not come into the lakes to tramp for a cargo. If they come in it is because they are delivering a cargo and/or a cargo is waiting. The prime examples of this trade are *project vessels* and *hard currency* vessels as described in the following section *Other Bulk and General Cargo*. A further deterrent to entering the lakes is the cost of installing seaway fittings. Generally estimated at up to $25,000 per ship, these fittings normally take one or two days to install, the work usually being done at Montreal.

Canadian East Coast ports are less competitive with the Seaway for bulk traffic than in general cargo, particularly container traffic. Competition for bulk traffic appears to affect U.S. based bulk more than it does Canadian originating bulk. Competition with the Seaway for Canadian bulk would come from Montreal and Quebec; Saint John or Halifax are too remote.

## UNITED STATES PORTS

U.S. export grain movements over East Coast ports utilizing unit train operations appear competitive[24] with the Seaway routing. Although the Gulf of St Lawrence elevation and transhipping rates charged U.S. shippers are not known, if they are not significantly lower than those charged for Canadian grain, and closer to comparable U.S. terminal rates, they would discourage this competitive traffic. It is not clear whether it is the rail mode that is competitive, or whether it is assisted by high Canadian terminal costs.

## CANADIAN GRAIN

The railways are at once partners with the Great Lakes-St. Lawrence System and its major competitors. Grain, coal and potash delivered to Thunder Bay are for furtherance by water to destinations along the System and overseas. Most (Wheat Board grain) traffic is handled by lakers but some (non-Board grains) is carried by foreign flag ocean vessels.

> ***On a full economic cost long term basis, it is concluded that for export grain:***

| | |
|---|---|
| ***with iron ore backhaul*** | ***direct rail is not competitive with transfer to water at Thunder Bay*** |
| ***with no backhaul*** | ***rail may be just competitive, but only if Thunder Bay can be by-passed and cleaning there is not required*** |

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[24] This competitiveness appears to have caused some difficulty to analysts, since it predated the Staggers Rail Act of 1980. What tends to be forgotten is that agricultural commodities moving by rail were exempted from regulation prior to the Staggers as a result of the agricultural exemption clause in the Interstate Commerce Act. This facilitated the development of confidential, or at least unpublished, prices. Also, the Interstate Commerce Commission was set up to regulate interstate commerce; but exports are not interstate commerce, and therefore did not come under ICC regulation. Accordingly, the railways were free to publish unit train rates as they saw fit.

***With respect to the longer term, railway costs have been falling in real terms, and there are prospects for future cost efficiencies. The threat that direct rail poses to Great Lakes carriage must be expected to increase.***

***In the shorter term at least, institutional considerations, particularly the location of lower St Lawrence terminal elevators and the requirement that grain be cleaned, and that this be done at Thunder Bay or the west coast, will keep the balance in favour of the water mode.***

## *At and East Grain*

Traditionally, grain moved by laker to transfer elevators along the lower St. Lawrence and to "Inland points" for furtherance by rail under the At and East subsidy program. This latter program also collected Ontario grown grain which was able to take advantage of the program. The February 1989 federal budget announced the ending of this program and Bill C-26 was recently introduced with the intent of bringing about the budget proposal. The importance of this change should not be lost on the System. Grain which otherwise would move either water direct or rail direct has been moving water-rail.

Termination of this program is expected to:

seriously impact the commercial activity at a number of Ontario ports in Lake Huron and Georgian Bay.

change the manner in which Canadian grain is exported, reducing movement through Halifax and Saint John[25], and enhancing the attractiveness of Montreal and lower St. Lawrence River ports.

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[25] In discussions with the Canadian Wheat Board, it appeared there is some hope for Halifax, but there is little chance that the elevator at Saint John will survive. This is consistent with a study conducted earlier this year by the Atlantic Provinces Transportation Commission.

Some in the railways believe that, on western grain, they can match the compensatory rate from "inland points" from Thunder Bay by setting up unit train operations to Montreal, Quebec and Halifax. This could mean that, in future, western grain would not move to the Bay Ports, for example, moving instead direct rail to the lower St. Lawrence or Halifax. It could, on the other hand, mean more laker movement directly to the lower St. Lawrence and the demise of Bay Port elevators and perhaps flour mills. It could also mean the movement of more Ontario grown wheat by water through ports not eligible for the low At and East rail rates.

## Rail Running Through Thunder Bay

Unit train operation from major inland terminals such as that at Weyburn Saskatchewan to lower St Lawrence ports, eliminating all handling and storage costs at Thunder Bay, could compete successfully with Great Lakes carriage, but only under certain circumstances.

The competitive position of the railways relative to the Great Lakes/St. Lawrence System is being closely monitored by participants in the grain business. Many believe that rail is almost competitive east of Thunder Bay. The ability to receive unit trains in the east could become a major factor in such movements developing; some Gulf of St Lawrence transfer points do not have rail service and must receive by water.

Canadian railway traffic drops sharply east of Thunder Bay. The railways are exploring the closure of all but a single mainline across Northern Ontario. They have more than sufficient surplus infrastructure capacity to carry all the grain currently moved on the Lakes. Freight car and locomotive capacity can be expanded on relatively short notice, and in comfortable increments.

In 1987 the railways published a trainload rate of $24.38 per tonne for movement of at least 850,000 tons of wheat from Thunder Bay to Montreal, Quebec, Sorel and Trois Rivieres as part of the Canadian Wheat Board's winter shipping program. With a discount of $1.50[26], a blended rate to the above ports of $23.00 would be reasonable. This presumes use of government owned hopper cars which, without special permission are limited to operation between Thunder Bay and the west coast.

Approaching from the perspective of cost, Research and Traffic Group railway cost data, developed from analysis of movements of known cost, blended CP (from Thunder Bay) and CN (from Armstrong) carload 1987 costs for hopper movements are $24.25 using shipper owned cars, and $27.50 if they are provided by the railway. Solid train services, running straight through from the prairies, would probably be some 15% to 20% less or $20.00 plus an additional $3.00 for railway provided cars[27].

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[26] The Canadian Wheat Board Annual Report 1987/1988 shows a cost of $32.94 per tonne from Thunder Bay to St. Lawrence in 1987. This includes loading at Thunder Bay, elevation at the Gulf, shrinkage and switching, and thus can be equated with the published railway rate. More importantly, however, the Report shows a reduced cost of $31.345 in 1988, presumably the result of confidential contracting. With CWB reported costs of $5.18 (1987) and $5.16 (1988) per tonne costs for Thunder Bay elevation, etc., one can estimate a rail rate reduction (discount) of the order of $1.50/tonne.

[27] At present, movements by rail east of Thunder Bay are complicated by car supply logistics since most covered hoppers made empty there are owned by other than the railways. There are about 20,000 covered hoppers owned by several organizations including; the Wheat Board (which owns most) and, other cars owned by the Federal Government and the Governments of Alberta and Saskatchewan. These cars, effectively managed by the Grain Transportation Agency, are not normally allowed east of Thunder Bay.

In discussion at the GTA, it seemed possible that the railways would be able to get permission to use these cars east of Thunder Bay if they made a similar number of their cars available for overall grain use in western Canada. This position was doubted by others in the grain business who believed that pressure would be brought to bear on the GTA to not allow these cars east of the lakehead because they would be seen, by the lakes carriers, as a subsidy to the railways. Such a problem would impede regular rail movement to the east, either from Thunder Bay or direct from prairie points.

The cost and rate approaches yield consistent results, and it can be concluded that the railways would be interested in long term high volume grain traffic through Thunder Bay (and/or Armstrong) at 1987 rates of the order of $23 to $24/tonne (railway provided cars). If, by by-passing Thunder Bay, the cost of Lakehead elevation[28] was removed from the total distribution costs for rail from the prairies, rail could be competitive with rail/lake at laker rates of $19 to $20/tonne.

To develop a cost comparable to the rail figures above, for the Great Lakes carriage of grain from Thunder Bay to St. Lawrence river ports, the *modified vessel costing model* was employed. Costs for a Duluth origin were also computed. Concurrent with the computations on grain downbound, it was also necessary to look at iron ore upbound since one serves as backhaul to the other.[29] The costs developed for 1987 are:

**Transport Costs[30] by Laker**
**Grain and Iron Ore (per Tonne)**

| | **Vessel Utilization** | **100%** | **80%** |
|---|---|---|---|
| 1. | Grain - Thunder Bay to Quebec (empty backhaul) | $16.81 | $20.50 |
| 2. | Grain - Thunder Bay to Montreal (empty backhaul) | $16.37 | $20.00 |
| 3. | Grain - Duluth to Port Cartier | $14.89 | $18.15 |
| | Iron ore - Pointe Noire to Chicago | $ 9.52 | $11.61 |
| 4. | Grain - Thunder Bay to Port Cartier | $15.45 | $18.84 |
| | Iron ore - Port Cartier to Hamilton | $6.31 | $7.70 |
| 5. | Grain - Thunder Bay to Quebec | $13.09 | $16.00 |
| | Iron ore - Sept Iles to Hamilton | $7.37 | $9.00 |

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[28] The Wheat Board's *Annual Report for 1987/1988* showed an elevation charge for wheat at opening of navigation in 1988 of $4.31 per tonne.

[29] Vessels carrying grain to lower St. Lawrence river ports have traditionally carried iron ore from ports on the north shore of the St. Lawrence such as Sept Isles and Pointe Noire on the return trip to the head of the lakes.

[30] Includes all capital and operating costs of vessel, and voyage costs such as port charges, harbour dues, handling, Seaway tolls, pilotage and bunker fuel.

A major impediment to direct rail movement is the ability to assemble, load and unload unit trains. Bunge Elevators at Quebec City have received trainloads from Thunder Bay on the CWB's winter shipping program. Policy changes such as "pay the producer" could lead to an evolution in grain handling and transportation commencing at the farm and flowing through the system.

Another impediment is the (compulsory) Canadian policy of cleaning grain at Thunder Bay (and Vancouver and Prince Rupert) prior to shipment either for domestic or export consumption. This costs between $1.84 and $2.05 per metric tonne for wheat and, combined with the rigid grading system employed by the Canadian Grain Commission (additional cost of $.74 per metric tonne), ensures that eastern movements all pass through the terminal elevators in Thunder Bay. Canada is the only major grain exporter utilizing such a system which, according to the Board, allows Canadian grain to be sold for a premium over U.S. grain which is not cleaned, and is not as uniform in grade. However, recent market weakness of Canadian grain suggests study of the continuing value of a compulsory cleaning policy. If Canada were to change its stance on cleaning, or it were to be instituted on the prairies, handling at Thunder Bay could be eliminated and the economics of unit train operations into eastern Canada enhanced.

The costs for the movement of grain[31], noted above, are long term. On a *fading out of business* basis, the marine carriers could offer much more competitive rates, but their ability to do so would diminish over time.

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[31] The costs compare quite closely with estimates presented in an earlier report for the Ministry and for the Dominion Marine Association (The Trade and Transportation Group and Wintemute, Randle and Kilimnik, *Great Lakes/St. Lawrence System: Review of Grain Transportation Cost Structure*, May 1987). In that report, grain from Thunder Bay to St. Lawrence river ports was estimated at about $15.65 per tonne (1985). The latter number is exclusive of seaway cargo tolls (approx. $.92 per tonne) U.S. exchange on seaway tolls, and perhaps other small charges.

## IRON ORE

> ***The economical supply of Labrador iron ore to the Ontario steel industry depends on the St Lawrence Seaway system, and on grain movements through the system to lower St Lawrence ports. Without balancing grain movement, the cost of iron ore transport would more than double to over $13.00/tonne. Without Seaway transportation it could increase to some $21.00/tonne.***

Iron ore from Quebec and Labrador to Canadian and U.S. steel mills on the Great Lakes traditionally serves as backhaul (from north shore origins and latterly from Quebec as well) for lakers delivering grain to lower St. Lawrence ports. This helps to keep up Great Lakes carriers revenue and/or keep down the cost to the shippers of both the grain and the iron ore. With grain traffic volumes through the System uncertain, as a result of greater movement through the west coast, there is expected to be greater upward pressure on iron ore rates. The upward pressure should affect movements to Hamilton first since that route provides less of a backhaul than does, for example, Chicago.

On a backhaul basis, a cost of approximately $7.00/tonne is attributed[32] (according to the modified Great Lakes and St Lawrence Vessel Costing Model) to iron ore from Port Cartier to Hamilton. It is, however, necessary to consider circumstances whereby the grain traffic might be insufficient to provide backhaul capacity for all the iron ore that would move inbound. In this regard, it is reasonable to presume that Hamilton, being closest to the ore source and providing the shortest backhaul traffic, should be considered at the margin. Of course, this is an oversimplification. The U.S. East Coast ports with rail to U.S. steel mills routing, and the ramifications of market pricing, not to mention ore swaps and the consequences of vertical integration in the steel industry, would, in reality, ensure a more complex solution. For illustrative purposes, however, two options are considered:

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[32] Actually the vessel costing model produces an *allocated* cost. The *decremental* cost, at which a rational carrier would decline the backhaul, is much lower.

(1) Seaway carrier from Port Cartier to Hamilton with empty backhaul
(2) Ship from Port Cartier to Quebec City, with rail to Hamilton.

### (1) Seaway Shuttle

For the first option, a self-unloader shuttle service was costed using the *vessel costing model*. Empty backhaul was assumed. The cost calculated for this service was $13.30/tonne, essentially double the $6.50 (allocated) cost for grain backhaul movement.

### (2) Ship/Rail

The least costly Canadian route for the delivery of Labrador ore to Hamilton[33], were no Seaway service, available was more problematical. A cost of $3.70/tonne was computed for year-around lake self-unloader operation between Port Cartier and Quebec City. This is understated to the extent that costs attributable to ice strengthening of the vessel and delay due to navigation in ice were not included[34]; $5.00/tonne might be more reasonable. To this must be added $11.00 for railway transport from Quebec City to Hamilton, and a terminal transfer cost at Quebec, say $2.00. Recollecting that the railway cost is not a rate, and allowing e.g. $3.00 for contribution to railway overhead and profit, the total charge comes to some $21.00/tonne.

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[33] This presumes that the Hamilton industry was still interested in receiving Labrador ore under these circumstances.

[34] One could perceive a carrier using its self-unloader(s) in the Lakes during the open season and undertaking this service while the Seaway was closed for the winter. The ore would be stockpiled in Quebec and shipped by unit train on a 12 month basis.

Marine transport to the U.S. East Coast and rail onward to Hamilton might compete favourably with this option. Regardless, however, this would clearly place the Canadian steel industry using Labrador iron ore at a distinct competitive disadvantage relative to U.S. production.

## POTASH

> ***The Great Lakes/St Lawrence transport of Saskatchewan potash to users in Southern Ontario is considerably cheaper than the rail alternative. However, although substantial volumes move by water to U.S. destinations, the Ontario traffic is dominantly rail.***
>
> ***Abolition of the At and East grain rates and abolition or extension to water of the Maritime Freight Rates Act, would enhance the competitiveness of the Seaway transport of New Brunswick potash. A solution to overcome the complex combination of inventory and terminal investment considerations, that has overwhelmed rail's cost disadvantage in the movement of Saskatchewan potash to Ontario, requires more detailed study.***

The railways have successfully developed unit train movements of Saskatchewan potash to off-water transfer facilities at Putnam and Ridgetown in southern Ontario at the expense of rail-lake movements via Thunder Bay. Waterborne potash movements to lake ports involve companies such as Cargill at Sarnia and Thompson at Port Stanley who are not affiliated with the major rail transfer facilities. It is important to note that much of the railways' success in potash has come about with the advent of confidential contracting. The timing may be coincidental but fortuitous for the railways

Great Lakes movements which once exceeded 2 million metric tonnes per year are now reduced to about 1.5 million tonnes (1987). Another facility at Eastport (Hamilton) is on water but is believed to receive New Brunswick potash by rail. Industry interviewees contend that the Province of Ontario provided part of the financing for the Putnam facility.

Waterborne potash moves extensively from Thunder Bay to U.S. Great Lakes ports. A much smaller but nonetheless consistent movement takes place to several Ontario ports. To obtain an approximation of comparative carrier costs, the Research and Traffic Group's costing models were utilized. The results, when using Port Colborne as the sample destination were:

**Potash from Thunder Bay**

1987 Costs

| | |
|---|---|
| rail (solid train) | $21 per tonne |
| lake self-unloader | $13 per tonne |

Even with savings on a run-through, rail appears non-competitive. Why has rail captured such a substantial share of potash traffic; partially at least because of inventory planning and carrying cost. Potash is very seasonal with a large peak in the spring and a smaller peak in the fall. The spring peak occurs prior to the opening of navigation at the lakehead giving the year around mode an advantage. As mentioned above, rail also has an advantage with the major transfer facilities now located inland. Further in a study done for the Ministry of Transportation in 1988, Sandwell Swan Wooster showed that the vessel loading rates for potash are inherently slower than for coal, and it is therefore more costly to move by water. This may partly explain the success of unit trains of potash directly to market while coal is transferred to vessel at Thunder Bay.

Potash Corporation of Canada (a New Brunswick producer) is considering a facility at St. Thomas to serve that market area but does not appear to favour use of Port Stanley which currently receives potash. It views this port as shallow draft and more suited to tourist operations. They may be planning to use covered hoppers returning empty after delivering wheat to the Maritimes, but the demise of At and East would have an impact on this otherwise empty backhaul opportunity. New Brunswick potash to Ontario by rail, but not by water, is subsidized under the Maritime Freight Rates Act[35]. Without the *At and East* and *MFRA* St Lawrence movement of this potash would be a more attractive option.

## COAL

> ***Western Canadian coal has moved in significant volume during the last several years through Thunder Bay to Ontario Hydro and the Ontario based steel companies. Other Ontario coal demand is satisfied with U.S. coal moving across the Lakes. With a value f.o.b. the mine of the order of $35/tonne, and transportation costs of approximately $40/tonne for western Canadian coal and $20 for supplies from U.S. sources, coal is very sensitive to transportation cost.***

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[35] It is noted that potash moving by rail from New Brunswick to Quebec and Ontario effectively benefits from two subsidy programs; one directly and one indirectly. The indirect benefit stems from covered hoppers made empty after delivering *At and East* grain to Halifax and Saint John. The direct benefit is the reduced rail rate paid by the shipper as a result of the *Maritime Freight Rates Act*. Under this Act, commodities grown, harvested or mined in *Select Territory* (the Atlantic Provinces plus part of Eastern Quebec south of the St. Lawrence river) are entitled to reduced rates for that portion of the move that occurs within *Select Territory*.

Potash is eligible for a 50% reduction on that portion of a westbound movement that occurs in that territory. The basic subsidy level is 30%. Potash is also eligible for the Selective Westbound Assistance of 20% under the *Atlantic Region Freight Assistance Act*.

The subsidy does not apply to direct rail shipments to the United States. While this is so, there are ways around such statutory provisions. Other commodities, most notably peat moss, ultimately sold in the United States benefit from this program. The peat moss is shipped by rail to a transfer facility near Niagara Falls, stored and then trucked into the U.S. It could be argued that a similar operation on potash would also work. If it did, this could further alter the competitive balance between Saskatchewan potash and New Brunswick potash, and hence the movement of U.S. bound potash through Thunder Bay.

***Although Ontario Hydro, as a publicly owned utility, may be more sensitive to environmental concerns, and therefore less predictable, industry must be expected to use as little product from the more expensive western source as possible. Competitively, U.S. coal and coal that need not pass through the Welland should be secure from modal competition. Movements through Thunder Bay to Lake Ontario should also successfully resist rail competition.***

## Ontario Hydro

Ontario Hydro appears to be prepared to continue using some western coal since it has a lower sulphur content than U.S. coal. In discussion with Ontario Hydro, it was learned that their coal fired plants are currently operating at about 40% of capacity. This is expected to increase to about 60% in the next decade, which would mean about a 50% increase in the demand for coal unless some plants were converted to natural gas, which is unlikely. At present, most of Ontario Hydro's coal supply comes from the United States with about 3 million tons per year from western Canada by rail/laker transportation.

Should this demand materialize, the utility will be moving some 20 million tons of coal per year on the Lakes by 2000. The use of coal fired plants will, to some extent, be determined by potential legislation on acid gas emissions. On one hand, western coal is lower in sulphur; on the other, scrubbers will have to be installed at all plants by about 1994 or 1995. Ontario Hydro's thermal plants were designed to consume U.S. coal, the characteristics of which differ from those of Canadian coal. At present, Nanticoke is the only plant receiving coal from western Canada since it has a coal blending facility. To use western Canadian coal at other plants, Ontario Hydro would have to blend coal on site. Problems cited by the steel industry such as freezing are not seen as major problems, but merely minor irritants. However, it is more difficult to handle.

As far as transportation is concerned, Great Lakes transport is seen as essential since plants were set up to receive by water. While most plants are served by rail, the rail installations were put in place for the handling of occasional large items such as boilers. To permit rail delivery of coal, installation of a loop track, dumping facilities and thaw sheds would be necessary, as well as significant land acquisition, probably at substantial cost bearing in mind prices in southern Ontario. Also, rail/laker is cheaper than direct rail, both through U.S. Lake Erie ports and through Thunder Bay. In the latter regard, the Vessel Costing Model calculated a cost for a coal shuttle from Thunder Bay to Nanticoke of $9.17/tonne.[36]

## Steel Industry

The steel companies have been less satisfied than Hydro with western Canadian coal. They cite it as too fine, and hard to unload and use during cold weather since it has more of a tendency to freeze than does U.S. coal. Costs appear to be a factor although steel company ownership of U.S. mines may also be an important consideration.

DOFASCO has in the past used western Canadian coal, and has even brought some in via the Panama Canal with a transfer at Contrecoeur for between $4-5 per ton less than rail/laker via Thunder Bay. At present, rail rates from mine to Thunder Bay are about $30 per ton compared with $15 per ton from West Virginia to U.S. Lake Erie ports. Similarly, laker costs from U.S. Lake Erie ports to Hamilton are about one-half the level of the costs from Thunder Bay to Hamilton.

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[36] Peat Marwick Consulting Group, in their confidential report to the Intergovernmental Secretariat to the Action Committee on Western Canadian Coal to Ontario, estimate $5.29/ton (5.82/tonne) for this same pair. The discrepancy is attributable to a number of variances, most tending to balance. However, among them:

> P.M. considers economies from backhaul traffic from Conneaut to Lambton
> P.M. estimates an average Nanticoke-Thunder Bay shuttle cycle time of 6.4 days; R.T.G. uses 7.6 days.
> P.M. assumes a 272 day operating year; R.T.G. 260 days.
> P.M. uses a blend of *available used* self-unloaders at a book value of $16 million and others at a *market value* of $31 million; R.T.G. presumes *new building* price of $43 million.

Both the P.M. and the R.T.G. figures are defensible, but the former is only 63% of the latter is a strong argument for detailed circumstance specific costing.

To obtain a better understanding of the costs associated with these movements, the modified *Great Lakes/St. Lawrence Vessel Costing Model* was utilized for three regular coal movements. All calculations were based on a maximum Seaway class self-unloader operating a shuttle service 260 days per year.

| Origin/destination | Round Trip (statute miles) | Cost per tonne 100% utilization |
|---|---|---|
| Ashtabula/Hamilton | 322 | (1987) $ 5.97 |
| Thunder Bay/Hamilton | 1810 | (1987) $11.56 |
| Thunder Bay/Nanticoke | 1616 | (1987) $ 9.17 |

Rail costs for a similar move were estimated at about $18 per tonne. A rail *run-through* would eliminate terminal costs at Thunder Bay and provide year around delivery, narrowing the cost gap. Sandwell Swan Wooster Inc. estimate Thunder Bay terminal costs at between $3.77 and $4.75/ton ($4.15 and $5.12/tonne), but much of this would seem to represent allocated fixed charges for a terminal with excess capacity. S.S.W. estimates indicate that the incremental cost would drop towards $2.75/tonne as volume rises. There would also doubtless be an incremental cost for receiving by rail at Hamilton, and the makeup of unloading facilities at the steel mills would have a bearing on the willingness to accept direct rail shipments.

Marine transport's advantage over rail is estimated to be at least $4/tonne. Even given rail's strategic pricing advantage (being both connecting carrier and competitor) that mode would have an uphill battle for new western coal traffic, should it materialize, that did not require significant terminal investment, even if the railway decided to compete aggressively.

### *Trucking*

> ***The truck mode is not competitive with the cross-Lakes or Seaway bulk transport of major commodities. Truck around versus water across is an important consideration for certain general cargo (see Chapter 4 below), but for bulk, trucking is more likely to complement Great Lakes carriage and enhance its competitive position with respect to direct rail.***

It is unlikely that truck could compete for any significant amount of the commodities discussed in this section of the report except, possibly, for grain if the WGTA is changed to a "pay the producer" option. In such an eventuality, trucking could become the ally of the lake ports and lake carrier fleet in competition with the railways. At present, trucking's role in grain transportation is limited to short haul operations on the prairies and in Ontario.

In some countries, Argentina for example, grain is trucked substantial distances to export ports. With "pay the producer", a producer could find it advantageous to avoid the local country elevator (save elevation charges) and the railway branch line (with full WGTA rates), and truck directly to Thunder Bay. It might even be advantageous to use commercial trucking. For example, country elevation, not including the removal of dockage, cost farmers over $6.00 per tonne in the 1987-88 crop year[37]. The full WGTA rate (shipper plus government share) from southern Manitoba was $20.41 per tonne (1987-88 crop year). Combined, the cost to the farmer would have been about $27 per tonne. It would be even higher with inclusion of the cost of freight cars provided by the various governments and by the Wheat Board. Would this rate interest a trucker?

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[37] Derived as follows: (1) Canadian Wheat Board *Annual Report 1987/88*, p 21. Country elevation and removal of dockage 1987/88 - $8.05, 1986/87 - $8.02. (2) St. Lawrence Seaway Authority, *The Seaway Transportation Costs Study, Phase I -The Canadian Grain Transportation Rates*, p.14, 1986/87 country elevator tariff $6.09, removal of dockage $1.67, total $ 7.76.

While the rate would probably interest a trucker, several institutional situations would have to be overcome. First, the system is set up to handle grain by rail. Second, there would be resistance from grain system participants such as the pools which have considerable investments in country elevators and from the Canadian Wheat Board which controls the movement and sale of "Board grains". Third, the provinces will be concerned with extra truck traffic on the road network. These are probably not all the hurdles to be overcome, but they should provide an indication of the magnitude of the change.

On short haul traffic, truck currently handles significant volumes of grain, potash and coal within southern Ontario. The grain is handled from farm to country elevator and then to mill (feed or flour) or to port for further movement, perhaps for export. A whole range of Ontario ports benefit from these movements, sometimes in conjunction with ongoing water movements. The water movements could be to export position or to another port to take advantage of the At and East rates. To date, truck has tended to complement water transportation on export traffic. In the future, it could compete with water, much as the railways could on western grain, to export position.

For potash, truck is not a viable long haul competitor either for rail or water. Again, it is an ally of water transport and Ontario ports by delivering potash from a port of delivery and seasonal storage, e.g. Sarnia, Port Stanley, etc., to consuming point, in competition with the railways and their unit train operations.

In southern Ontario, truck and water complement each other (and compete with rail) in coal transportation. Since most coal is brought across the lakes from U.S. ports, truck is a viable means of transporting this commodity from the dock to the consumer. The market is not in the millions of tonnes that go directly by water to Ontario Hydro and to the steel mills, but there are several hundred thousand tonnes delivered by truck annually.

### *Lower Building, Crew and Taxes Cost*

It is apparent from the foregoing that the Canadian Great Lakes/St Lawrence shipping industry does not currently enjoy a strong competitive position, particularly for the transport of western export grain. Inevitably, the capacity of Great Lakes Canadian flag shipping to respond to peaks in grain export demand will deteriorate. It has been suggested that, in response to an inability of Canadian shipping to compete or to provide capacity necessary to meet contracted exports, national restrictions on Great Lakes carriage of domestic products, particularly grain, be eased. This section explores the cost effect of, and the danger of, permitting:

> foreign built vessels,
> Great Lakes shipping that does not pay Canadian income taxes
> foreign flag shipping with foreign crews

to move export grain between Thunder Bay and the Lower St Lawrence export terminals.

> ***Foreign built lake bulker vessels, at currently offered prices and a typical Korean export financing package offered with the purchase of such vessels, would reduce grain and iron ore shipping cost by 25%. Reduction of the shipping company corporate tax from 50% to 5% would increase the saving to 28%. Acceptance of fully deCanadianized shipping in the domestic market, including characteristic wage levels would produce costs of the order of 65% of those of the Canadian shipping industry.***
>
> ***Savings in the cost of exporting grain, and inevitably other Great Lakes/St Lawrence movements would be significant but at the cost of a Canadian and Ontario industry, and the employment and other domestic benefits it generates. The institutional hurdles to be crossed, including legislation such as the Canada Shipping Act, might give rise to belief that such action could not be taken quickly. However, if delivery of export grain is believed at issue, change (and***

***the demise of Canadian shipping) could be decided quickly. Thus, it is suggested that Ontario prepare its case and substantiating data against such a possibility.***

## Cost Savings

To investigate the sensitivity of transportation cost to increasing degrees of *deCanadianization* the *Vessel Costing Model* was modified to focus on the significant parameters concerned. For a *base case* a Seaway Maximum bulker moving Grain from Thunder Bay to Quebec with iron ore backhaul from Sept Iles to Hamilton was selected. Vessel and financial parameters are shown and discussed in Appendix D, as are illustrations of cash flows and *the Vessel Costing Model* output.

The price and financial parameters used to analyze the sensitivity of grain/iron ore shipping cost to the use of foreign built vessels are the same as those for the domestic built ship with four important exceptions.

The price is $17.5 million delivered[38]. To this must be added a duty of 25% for a foreign built ship, for an approximate effective cost of $22 million.

Instead of a normal debt cost of 10%, Korean export financing of 60% of capital cost is assumed at a rate of 6$^{1}/_{2}$ %.

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[38] The price (for a Korean built vessel) and the importance of the topic were suggested by an industry representative at the Guild Inn *round table*.

In lieu of the special accelerated *capital cost allowance* for Canadian built vessels, a *diminishing balance* rate of 15% is applied.

In addition to 260 days operation in the Lakes, 100 days of revenue service outside of the system is assumed.

Also, as detailed in Appendix D, lower cargo capacity, higher speeds, higher fuel consumption, lower crew compliment etc., characteristic of the lake/ocean vessel assumed, were considered. The vessel costs/tonne for the foreign and Canadian built alternatives are:

| | **$ per tonne** | |
|---|---|---|
| | **grain** | **iron ore** |
| Canadian Vessel | 13.09 | 7.37 |
| Foreign Built Vessel | 9.87 | 5.55 |

Presuming that the conditions outlined above prevail, unit costs would drop by one quarter.

It should be noted that the above vessel price, utilization and financing assumptions reduce the importance of capital charges from 43.7% of total cost to 22.2%, virtually half. Furthermore, the assumptions, on which the analysis of the foreign built Lake/Ocean bulker option is based, are very optimistic. However, such is also the case for the computations with respect to the costs attributable to a new Canadian built Lakes bulker, particularly with respect to the assumption of 100% utilization.

The next logical extension towards the *foreign shipping* or *cabotage* situation relates to payment of Canadian income tax. This is an aspect often advanced as an impediment to a Canadian flag merchant marine. The vessel costing model, run assuming a hypothetical tax rate of 5%, generated unit cost figures of $9.41/tonne for grain and $5.29 for iron ore, a reduction of approximately 5% from the option of a foreign built vessel paying Canadian taxes and with Canadian crew.

The ultimate extension of the above discussion involves the replacement of Canadian labour with low cost crews from third world countries. It is apparent, from examination of the foregoing model output, that for the option under consideration crew wages account for somewhat over $2/tonne of grain and approximately $1.20/tonne of iron ore. Use of foreign labour could, at least, halve these numbers. On the assumption of half, the cost of *deCanadianized* GLSL shipping, relative to costs for a Canadian industry, is estimated as:

| | $ per tonne | |
|---|---|---|
| | **grain** | **iron ore** |
| Canadian Shipping | 13.09 | 7.37 |
| DeCanadianized Industry | 8.41 | 4.95 |

These figures are applicable to a single vessel operating at 100% capacity with 100% iron ore backhaul. For the industry as a whole the absolute values must be low, particularly for grain. More reasonable figures would probably be some 30% higher for grain and 15% for iron ore, say:

| | $ per tonne | |
|---|---|---|
| | **grain** | **iron ore** |
| Canadian Shipping | 17.00 | 8.50 |
| DeCanadianized Industry | 11.00 | 5.75 |

## Industry Impact

The implications of the possibilities examined above would be major. Possibly, the rationale for deCanadianization would be competition with rail to tidewater (east or west). More likely, the trigger would be impending inability of the Canadian shipping industry, using only Canadian built ships, to deliver contracted quantities of grain. Should foreign or *deCanadianized* shipping be permitted to carry cargo through the system between two Canadian ports (assuming that export grain is really domestic in the first place), its effect on the domestic shipping industry would be immediate. The reason might be short term but the impact would be virtually permanent.

The initial effect of opening what is now a restricted domestic trade to lower cost shipping would be to reduce any remaining Canadian shipping in the trade to marginal status. Subject to whatever (artificial) regulations were imposed, utilization of the cheaper option would be virtually 100% while that of any remaining domestic operations would fall. Also, it would not be feasible to restrain foreign shipping to the grain trade. Obviously, the iron ore would also be carried in these vessels. Also, while under other circumstances, it might be practical to introduce international shipping on a short term basis only, shipping suitable for efficient Seaway grain shuttle service is not believed generally available on short notice. The relative specialization of the Great/Lakes St Lawrence vessels and carriers would be expected to force longer term commitments and consequences.

## Policy Considerations

The strongest policy argument for *deCanadianization* of the Great Lakes/St Lawrence export grain trade would seem:

> Foreign flag shipping moves all grain out of the West Coast. Balanced circumstances in the GLSL would allow efficient equilibrium with respect to the east *vs* west rail issue.[39] In one dimension, Thunder Bay would be placed on an equal footing with Vancouver and Prince Rupert.

DeCanadianized shipping presumably would be introduced to improve the economics of the export grain industry, and/or restore the Great Lakes fleet. It is necessary to consider the broader economic policy implications of this possibility. First, however, it is necessary to consider two competitive aspects; there could ultimately be more.

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[39] An alternative employing the same basis logic would see subsidies under the WGTA extended east to tidewater. A position Ontario might consider, this would serve to enhance domestic employment.

> Canadian grain is not now moved through the (foreign) Mississippi system. The rationale for not doing so would be undermined by use of foreign shipping in the Great Lakes/St Lawrence.
>
> Insofar as the marine mode competes with direct rail, deCanadianization would disrupt the competitive balance in favour of the mode with the least domestic content. Why not treat rail similarly?

Thorough policy analysis of the issue in question is beyond the depth possible for the present study. It is, however, recommended that Ontario prepare a response to this threat. Addressing the importance of preconsideration before emergence as an active policy issue, it is noted that introduction of foreign shipping into the Lakes is more likely to start as a temporary expediency than as a conscious long term policy decision.

If the analysis of this paper with respect to the financial viability of rebuilding the Great Lakes fleet proves reasonably accurate, there could be a sudden shortage of transportation capacity to serve the established infrastructure. Time for Ontario to develop a comprehensive position would be short.

It is reasonable to expect that foreign shipping and cabotage would be first introduced on an *emergency* basis, but opposition at that point is the only practical approach. Once established, it would lead to the rapid demise of remaining Canadian shipping, and the pressure from the established owners of the grain infrastructure to maintain cabotage (not to mention the plight of Ontario's steel industry) would be difficult, if not impossible, to resist.

# CHAPTER 3

# CANDIDATE OPPORTUNITIES INVESTIGATED

The study documented in this report was general in nature and broad in scope. It was intended to provide background research for focused policy studies. This chapter represents the initial phase for issue specific and action oriented examinations that follow the preliminary identification of issues and uncertainties deemed sufficiently important to Ontario.

Focus was on the identification of concerns and opportunities, rather than on their exploration. Concerns identified are itemized and discussed in Chapter 5 of this report. In the course of the study, however, it became clear that Canadian Great Lakes shipping is on a downward trend; that expedient exploitation of available opportunities is called for. Thus, certain candidate opportunities, as they appeared, were given a degree of preliminary analysis. These were:

***Technology and Operational Innovation***
***Season Extension***
***Overseas General Cargo and Port Marketing***
***Cross-Lakes Ferry Services***

*A posteriori*, the topics, the preliminary analysis of which is reported below, are not the most important opportunities identified. As is clear from the earlier chapters of the report, the most important issues relate to aspects of the transportation of export grain. Of the above candidate opportunities,

> ***while operational innovation holds promise of cost savings, and cross-Lake ferry services may ultimately contribute to the Ontario U.S. freight transport system, none holds prospects for reversal of the present decline of the Great Lakes/St Lawrence system.***

### *Technology and Operations Innovation*

> ***It is apparent, from the analysis of Chapter 2, that the Canadian Great Lakes/St Lawrence shipping industry is losing the competitive battle with (in particular) the westward transport of Canadian and the Mississippi transport of U.S. export grain. Further, the industry's cost advantage over the rail mode has been shrinking. The brief exploration, documented in this section, focuses on the cost saving potential of technological and operations innovation as an opportunity to reverse the industry's fortunes.***

The section consists of two subsections.

> The first summarizes, in a general sense, technological and operational innovation that might be applicable in support of commercial navigation within the Great Lakes and St Lawrence Seaway System, during this or early in the next century. The exceptions in this regard are winter navigation and season extension, and new services (serving new markets); these topics have been treated separately.
>
> The second examines the sensitivity of GLSL commercial viability, as represented by vessel voyage costs, to the impact of innovation(s) that reduce labour cost, fuel cost and vessel cycle times.
>
> ***It is concluded that the future of the system will not be brightened by implementation of advanced vessel technology. Advances in infrastructure and its operation, that would enable reduced cycle times, appear to hold greater promise.***
>
> ***The Ministry of Transportation's 1987 paper Marine Innovations examines technological prospects in detail. The reaction of the 72 respondents (from over 500 invitees) reflected an overwhelming conservatism. This supports the implication of the present analysis that technology on the Lakes, except where new services or carrier competitive advantage is concerned, will lag the state of the art.***

## TECHNOLOGY AND OPERATIONS PROSPECTS

The examination of the relative costs of the different modes suggests that the Great Lakes and St Lawrence System will continue to face strong modal competition, particularly from rail. If it is to remain competitive, innovation --technological and operational-- will have to exceed, or at least match, the economies achieved over the same period by the rail mode. If the economic implications of long term technological prospects show that decreasing viability is inevitable, the value of technological improvements in the short term should be addressed accordingly, and a passive stance adopted. On the other hand, if economies achievable from emerging technology and operational methods hold long term promise, a more aggressive short term approach is appropriate.

### Technology

Because the capital investment is often a fixed sum per installation, most vessel technology innovation will benefit large transoceanic vessels more than, and therefore would be economically implementable earlier than for, the smaller and slower lakers where annual output (tonne kilometre per vessel) is much lower. This is particularly true for investments in fuel economy. On the other hand, savings on crew labour from vessel capital cost innovation may be more attractive in the Great Lakes context because of the use of high cost Canadian and U.S. crews.

Even in this regard, however, institutional impediments and the relative captivity of Great Lakes vessels to the (uncertain) Great Lakes trade may dampen the enthusiasm of carriers to invest in technology. In brief, engine and vessel performance technology on the Lakes can be expected to lag several years behind that used in certain ocean trades. Labour saving innovation might appear first in Great Lakes/St Lawrence service, but only under certain circumstances.

Technological change in Great Lakes and St Lawrence shipping through the early 21st century is expected to be centred on more automated operation, including navigation. With this technology, transit times, labour cost and fuel cost economies might be achieved. Of these, automation to achieve labour savings would be more important than fuel economies. But, over the long term[40], it is transit time improvements which are, by far, the most significant. It is important here to note a dichotomy of perspectives, with carriers probably making labour savings their priority, and policy makers showing greater interest in the potential of Seaway transit time reduction.

Vessel engines could be electronically controlled and directly interfaced with an automatic navigation system. Engine speed could be adjusted automatically, on the basis of currents and measured speed through the water, to achieve scheduled arrival at the next lock. All control would be from the bridge, and crew roles could be reduced to a monitoring function, with direct manual control used only on exception or when entering locks, constricted channels or a harbour. Vigilance monitoring technology would permit safe operation with one person on the bridge. Engine condition could be monitored electronically, probably with fibre optic circuitry, and maintenance scheduled on the basis of incipient problems detected.

New engines would substantially improve vessel fuel economy. Marine diesel engines of current design can exceed 40% thermal efficiency. Ceramics and consequent higher temperature operation could improve this still further, and more importantly, ceramic engines would tolerate broader fuel specifications and hence cheaper fuels. It is likely that most turbine powered bulk carriers of maximum Seaway size will be re-engined prior to or shortly after the turn of the century.

The technology of 2000 would, if implemented, enable commercial vessels to operate safely in the St Lawrence under conditions of highly restricted visibility and even with relatively sparse knowledge of local conditions. They could be equipped with a Loran or satellite location system, accurate by itself to within a few metres. For additional precision, an on-board computer system could integrate information from the ship's radar and the satellite system. Triangulation from shore based radar reflectors would calibrate the satellite signals[41]. Electronic charts with hazard alarms should become the norm of the early 21st century. Fog would not necessitate speed reduction. Expert systems would advise from communicating system control (shore) computers. Some vessels not appropriately equipped to participate would be required to carry pilots who would be equipped with portable systems.

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[40] Presuming new vessels will be commissioned and vessels will be replaced, and the capital cost for these vessels will have to be covered. Over the long term, this must be a valid assumption.

The trend towards ocean going vessels too large for the Seaway is expected to continue. Even more than today, transhipment will become the rule, with self unloading bulkers popular. Vessel to vessel cargo transfer, and measures to preclude spills during the operation, can be expected to increase. This will include grain[42], which logically will use pneumatic systems; conveyor systems will continue to be used for other bulk commodities, such as coal and iron ore.

Technology should also facilitate a longer navigation season and winter operation. The season for intra-lake and cross-lake traffic, in particular, can be expected to increase.

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[41] It seems that this is the principle employed by the McMaster University Communications Research Laboratory in their 'polarimetric radar' system.

[42] Vessel to vessel transfer would reduce the use of lower St. Lawrence river ports. Canadian flag carriage would not be mandatory for the move from Thunder Bay for transfers in international or foreign waters or to a "British" ship in Canadian waters designated as open to such a vessel. Since sheltered water is required for safe transfer, convenient locations outside of Canada's territorial waters are limited to St. Pierre and Miquelon.

## Operations Methods

The St Lawrence Seaway Authority has effected significant advances in operations management technology and flow control.

By the turn of the century, insofar as commercial vessels are concerned, available technology and operations management methodology will be such that the Great Lakes and St Lawrence System could be a fully controlled waterway. Vessels would move under direction of land based vessel traffic services (analogous to air traffic control). Vessels would follow prescribed courses at prescribed speed between 'booked' transits of locks and other bottlenecks. A computerized flow management system would provide information based on data entered by vessel traffic services personnel, and readings from ship borne instruments. The control system would be similar to that for air traffic, but simpler and without many of the redundancies necessary for air safety.

A computerized navigation and flow control system would increase system capacity, reduce transit times and improve pilotage efficiency. Under normal circumstances, there should be no waiting to transit locks.

Depending on the infrastructure cost recovery approach adopted (see Chapter 4 below), innovative commercial approaches would be feasible. Carriers could purchase transit at specific times from the Seaway Authority. They could enter into contracts with the Authority that provided for incentive and penalty payments and/or toll discounts should either party fail to maintain contracted schedules or exceed specified performance norms.

Computerized information systems would enable the Authority to market its capacity more commercially, by selling preferred transit at auction. The logical outcome of such a procedure would be substantial demand smoothing --near elimination of Seaway "traffic jams"-- and improved carrier performance.

## POTENTIAL VOYAGE COST SAVINGS

How might all these technological and operational management advances affect the viability of the Great Lakes and St Lawrence System? An important measure is the cost to the user of moving a tonne of freight through the System.

The set of parameters below was selected to circumscribe potential levels of efficiency improvement. Using these parameters, an analysis was done to show the extent to which a vessel's unit costs would change should these levels of efficiency change, i.e. the sensitivity of unit costs to potential economies.

| | |
|---|---|
| crew wages: | reductions of 20%, 40% and 60% |
| fuel cost: | reductions of 20% and 40% |
| transit time (turnaround): | reductions of 20% and 40% |

The following table[43] shows the potential impact of reductions in the per tonne cost of moving grain from Thunder Bay to Quebec City. The particular move costed presumed a backhaul of iron ore from Sept Isles to Cleveland but relative cost values, which are what matters, are largely (but not entirely) independent of the movement used for an example. The cash flows and basic data used in deriving the table calculations are attached as Appendix E.

Each of the three factors is varied to produce an estimate of the potential savings in shipping cost.

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[43] The modified Great Lakes-St Lawrence vessel costing model was utilized assuming a maximum Seaway size lake bulker.

# UNIT COST SENSITIVITY
# to
# VESSEL COST DETERMINANTS
# ($/tonne of grain)

TURN AROUND TIME UNCHANGED

| | | CREW COST | | | |
|---|---|---|---|---|---|
| | | 100% | 80% | 60% | 40% |
| | 100% | 14.59 | 14.15 | 13.71 | 13.27 |
| FUEL | 80% | 14.45 | 14.01 | 13.57 | 13.13 |
| COST | 60% | 14.31 | 13.87 | 13.43 | 12.99 |

TURN AROUND TIME 80%

| | | CREW COST | | | |
|---|---|---|---|---|---|
| | | 100% | 80% | 60% | 40% |
| | 100% | 12.30 | 11.95 | 11.60 | 11.25 |
| FUEL | 80% | 12.16 | 11.81 | 11.46 | 11.11 |
| COST | 60% | 12.02 | 11.67 | 11.32 | 10.97 |

TURN AROUND TIME 60%

| | | CREW COST | | | |
|---|---|---|---|---|---|
| | | 100% | 80% | 60% | 40% |
| | 100% | 10.02 | 9.76 | 9.50 | 9.23 |
| FUEL | 80% | 9.74 | 9.62 | 9.35 | 9.09 |
| COST | 60% | 9.74 | 9.48 | 9.21 | 8.95 |

Note: In the above table, percentages represent percent of estimated present level; the 80% columns and rows refer to 80% of the present level, a reduction of 20%; 60% refers to 60% of present, a reduction of 40%.

The first section of the table assumes that turnaround time is unchanged while the other two factors change. A 60% reduction in crew cost (from 100% to 40% of the present level) produces a saving of $1.32 per tonne. A reduction in fuel cost of 40% (from 100% to 60%) produces a cost reduction of $0.28 per tonne.

The second section assumes the same changes in crew cost and fuel cost as above, but with turnaround time reduced by 20%. Similarly, the third section assumes a reduction in turnaround time of 40%. By comparing equivalent figures in the three sections, it can be seen that the most spectacular savings occur when turnaround time is reduced to 60% of the present level. If the other factors remain unchanged, this 40% reduction in turnaround time would produce a cost reduction of $4.57 per tonne from the present $14.59 to $10.02.

While overall labour cost savings of 40% would produce an 88 cents a tonne reduction, this overstates the savings from a crew size reduction of 40%. A more automated operation will reduce the number of crew on a vessel, but will require higher average skill levels. Crew reductions will be at the lower skill levels, hence at the lower wage levels. Each vessel will still require a captain, sixty percent of a captain will not suffice.

From a policy planning perspective, it can be concluded that the effects of cost savings from labour and fuel economies will not have a major impact on the competitive viability of the Great Lakes and St Lawrence system. The effect of improving vessel turn-around is much more important, at least from the longer term policy perspective. Here, a 40% improvement with the other factors remaining unchanged, would produce a saving of $4.57 per tonne (from $14.59 to $10.02).

Further exploration of the implications of this sensitivity yields some interesting figures.

If the average port waiting time (not loading or unloading, but waiting to load or unload) assumed by the model to apply to Thunder Bay, Quebec and Sept Isles, could be reduced to the level (0.15 days) assumed for Cleveland, the cost of shipping grain would drop from $14.59 to $12.27 per tonne. This far exceeds savings in fuel and crew wages made possible by improved vessel technology, and at lower risk and effort to the carrier. Also, such waiting time reduction would enhance the attractiveness of higher technology vessels: combined with the above waiting time improvement, the value of a 60% and 40% economy in crew and fuel costs respectively is $10.94 per tonne.

Saving an average of one day per round trip in the Seaway would generate a unit cost saving of approximately $1.00 per tonne. Interestingly, this would be almost exactly the amount required to cover an increase in Seaway tolls of two thirds. This suggests a good deal of room for negotiation of *premium service* at premium charges. It appears that the Authority could provide a high level of operational service, and have no difficulty passing on the cost to the user -- not a surprising conclusion for a capital intensive facility.

One more caution is required to interpret the above in a realistic perspective. The benefits to the carrier of improved efficiency and faster turnaround come in two forms: reductions in out of pocket expenses, and increases in capacity. To reap the benefits of the latter, the carrier must sell that new found capacity. Without increased demand to fill the increased capacity, and if one presumes a competitive market, the savings from the additional capacity, or some of them will tend to flow through to the shipper. Over the long term, of course, the supply of vessel capacity will adjust to this new level of efficiency in the absence of equivalent market growth; so an appropriate share of the benefits ultimately will accrue to the remaining carriers.

### *Season Extension*

There is a considerable volume of literature on the topic of winter navigation on the Great Lakes and St. Lawrence, most of it from some ten years ago when season extension was a major issue. This study does not specifically review this literature. Rather it looks at the subject of winter operation as it relates to the 1990s; it then goes on to review the economics of an all year operation and how that might brighten the System's long term economic prospects.

> ***Season extension is not a current issue. Modest extension is attainable should demand justify, and there will be niches for cross-lakes year around operation. While physically possible, cost and environmental considerations render complete year round System operation impractical.***
>
> ***Capital cost could be in the billions of dollars. Operating cost estimates vary from $10 to $50 million for a one month extension, and from $25 to $150 million for eleven months operation. Carriers would face increased operating costs and reduced efficiency that outweighed the value of increased vessel utilization, and would not operate year around unless shippers were willing to pay premium rates.***
>
> ***Season extension would make the Seaway more attractive for both Canadian and U.S. grain exports, and for general cargo. For iron ore and coal, the advantages are less obvious.***

## GENERAL

It seems that this is an issue that was. Current trends and thinking do not suggest that any more than modest season extension is a realistic intermediate term prospect. It is apparent that the Seaway, as opposed to intra lakes and cross lake commerce, has a niche where the net benefits of season extension are modest at best. At the same time, the full costs of winter operation are becoming better understood.

The technology for keeping the System physically open for an eleven month season is not in doubt, although there are outstanding questions to be resolved concerning replacement navigation aids (for floating buoys). The topic is intensely political, both in Canada and in the U.S. environmentalists and the hydroelectric companies have strong negative opinions.

Economically, the subject of Seaway season extension is seen in Canada as a competition between the various regions. It is seen as providing benefits to the Prairies and Ontario at the expense of the Maritimes, Quebec and British Columbia, and possibly Alberta as well. This is particularly relevant under circumstances that doubtless would prevail, at least for many years: the costs of providing an eleven month season would come from public funds, but could not be recovered through carrier user charges.

## ATTRACTIONS AND AVERSIONS

There are many attractions to all year operation on the Great Lakes and through the Seaway. Port and vessel utilization would increase. New cargo could be attracted. Storage capacity costs and inventory carrying costs would be reduced. Earlier payment for exports, particularly grain, might be achieved. System capacity would be expanded. Qualitatively, a most attractive aspect would be psychological: Canada and the U.S.

would be seen to have mastered their physical environment[44]; the Seaway would have a *mainstream* image; no longer would the world hear the stories of ships *stranded* for the winter.

On the other hand, winter operation would disrupt a social pattern that has been established over many years. There is good reason to believe it would be more environmentally risky. Weather on the lakes in winter can be savage. Vessels are frequently covered with thick ice. Shipboard inspections (fuel valves, etc.) are unlikely to be more thorough, but the cold and ice will cause greater wear and tear. Spills could be more likely, but more difficult to detect, correct, and clean up. Shoreline erosion and water turbulence and turbidity would increase, and serious ice damage to locks and power stations is a real prospect. Hydroelectric generation capacity would be lost, and labour costs would rise.

## FEASIBILITY AND SYSTEM COSTS

Without doubt, winter navigation on the Great Lakes and through the Seaway is technically feasible. Some problems such as keeping still water channels open are relatively easily solved[45], others such as the impact of floating ice in the St Lawrence are more problematic. However, greater problems relating to navigation through ice have been overcome elsewhere.

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[44] This is a major impetus in the USSR.

[45] Some of the factors to consider for season extension include the icing of berths or locks where the still water chills on the top, falls to the bottom until the surface water reaches freezing temperature. The goal is to keep the water underneath warm so when it surfaces it cannot freeze and will erode any ice crystals or leave just a thin slice of ice to navigate through.

This can be accomplished by using a compressed air bubbling system such as:

1. A grid of pipes along the bottom of the berth or lock with small 1/16 inch holes, bubbling constantly;
2. A hose, bubbling constantly inserted through a small hole of already formed ice to erode the ice around the hole;
3. A burp system; one massive bubble being released intermittently.

These systems are inexpensive and will keep most berths and locks open.

For the Seaway, lock modification and other engineering work would be required; in 1979, the U.S. Army Corps of Engineers estimated a capital cost of $1 billion to support an 11 month season. Cost indexing would suggest a figure 80% higher for 1989. Operating cost estimates for season extension vary broadly, depending on items presumed to be included and the perspective of the estimator on the issue. Between $10 million and $50 million for a one month extension seems reasonable. Extension to 11 months would run $25 million to $150 million annually.

Underlying this broad range is a variety of perspectives on who should pay for what and why, a problem area that could be simplified greatly should the concept approach commercial viability.

## CARRIER COSTS IMPLICATIONS

It is generally presumed that season extension and all year operation lead to important vessel cost savings. Such savings are in the form of increased capacity which results from the ability to operate a vessel for a greater portion of the year. These savings are only realized, however, if the increased capacity can be used profitably. Some vessels, Canadian and foreign, leave the System over the winter months to operate in other markets or to undergo planned maintenance. For these, there is no increase in profitable capacity, and thus no advantage from a longer season in the Great Lakes and St Lawrence System.

For those that would operate in the System during the winter, travel in ice is expensive. The major reason is that movement is slower[46]; in thick ice it is much slower. Also contributing to cost, fuel consumption will be higher and vessels will sustain damage.

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[46] Hickling-Partners estimate a 1/3 reduction in vessel speed for a season extension of 30 days.

Vessels will try to move in convoys in ice, particularly when following ice breaking support. This causes congestion at terminals, locks and other bottlenecks, and reduces the speed of all vessels to that of the slowest in the convoy. Furthermore, the operation of locks in winter is slower. These factors increase transit times significantly.

This fact alone would have the effect of increasing most vessel operating unit costs. In addition, fuel consumption would be higher, so, presumably, would insurance costs. Labour would be no more efficient; indeed, larger crews may be needed in winter conditions.

Daily vessel operating costs for an extended season are estimated at 20% above the average for an 8 1/2 month season[47]. Furthermore there is an estimated 10% capacity loss for a vessel operating through the Montreal to Lake Ontario Seaway in the winter. Vessels pick up ice, flow and water levels tend to be lower, and draft is more restricted.

Ice strengthening required for winter navigation, besides adding to a vessel's capital cost, also increases its tare weight, thus reducing its capacity at maximum Seaway dimensions. These higher capital costs and lower maximum payloads throughout the year are economically attributable to the few months of winter operation.

The following observation is an attempt to quantify this issue. Assume that an additional investment of 6%[48] in the capital cost of a vessel is required to increase its operating season by 29% (from 8 1/2 months to 11 months per year). Any financial return on that investment can be eliminated by average turnaround frequency reduced to 70% and only a 7% loss of carrying capacity. The owner is as well off to tie up his vessel for 2 1/2 months a year and avoid the added 6% investment. This assumes that the revenue from the cargo moved during this extended season will be sufficiently high to compensate for any potentially higher operating costs described earlier.

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[47] Hickling-Partners op. cit.

[48] Estimates vary from 5% to 17%.

## VALUE OF ALL YEAR SERVICE

In addition to the costs discussed above, there presumably would also be charges to the carriers to recover at least some of the cost to the System of extending the navigation season. If one accepts the argument (above) that significant financial benefits to vessel owners would not materialize[49], winter operations would be of relatively high cost.

It must be concluded that a carrier would have no reason to operate throughout the year, unless shippers would be prepared to offer a premium for winter service, or there is profitable traffic that could only be attracted to the System if it is operating throughout the year. What traffic might be of this category?

### Bulk Traffic

For bulk Seaway traffic, all year navigation would allow greater flexibility in inventory management. There would be less storage required, and potentially lower inventory carrying cost. The need for higher cost rail movement of supplemental supplies would be less.

This may prove a significant determinant of Seaway traffic in the case of grains, both Canadian and U.S. The importance in the case of petroleum products is not obvious, but careful scrutiny is warranted. For other bulk commodities, this is expected to be much less important. Coal and iron ore are raw materials with reasonably predictable short term demand (a few months). Also, coal, and to a lesser extent iron ore, are susceptible to freezing. Frozen coal must be broken or thawed prior to loading or unloading, a compelling reason to concentrate transportation in seasons where freezing conditions are not severe.

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[49] A caveat is necessary here. The advent of an unanticipated surge in demand and consequent vessel capacity shortage could attribute an unusually large marginal value to capacity. Of course, in this event the infrastructure and vessel modification necessary for year around operation would not be in place.

## Container

General cargo may be more sensitive to all year operation of the Seaway, or portions thereof. Certainly, this is seen as a necessary condition for international container operations into the Great Lakes. Is it also a sufficient condition? Internationally, the current competitive trend is towards large vessels and a focus on minimum transit time from origin to ultimate destination. The Great Lakes/St Lawrence System is a circuitous route for most international container cargo. Time would be lost and most modern container vessels would be excluded by their size.

Doubtless, however, some international operator could find a niche providing direct container service into the Lakes. Shippers in close proximity to lake ports would be the obvious targets. The shipping line probably would be small, and the operation marginal. For most traffic, competition with rail would be difficult.

One must then consider whether the net benefits would be worth Canadian and American government intervention[50] (subsidized winter access to the Lakes) on such an operator's behalf. Industry in the Great Lakes States and Ontario would benefit from the service and perhaps from the competitive effect it would have on the ports of New York, Baltimore, Montreal and Halifax. If the economics of the service are marginal, however, this effect will also be marginal. The inland ports and their labour could benefit at the expense of those on the U.S. seaboard, and Montreal and Halifax. In Canada, the investment or subsidy probably would not increase benefits, but merely transfer them from Halifax and Montreal to Ontario, the opposite direction to what the present economic needs seem to suggest.

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[50] Provision of winter navigation would amount to (further) direct government intervention in the transportation market.

## Non Containerized General Cargo

The Seaway offers greater prospects for non container general cargo such as machinery, forest products and steel. Winter operation could enhance the prospects for such trade, and it is something that should be considered during the study.

In that regard, there are some potential anomalies which may be interesting to consider. For example, the Seaway, operating all year, might more cheaply deliver overseas steel to the U.S. in competition with Ontario production and the U.S. industry (which in turn uses Canadian iron ore, which moves through the Seaway). Intuition suggests that a greater focus on a partial extension of the season or on all year cross lakes operations might do more for Ontario trade.

## Carrier Considerations

Notwithstanding the ability to open the System to a longer season, ship owners may be reluctant to take advantage of its availability. In general, they consider ice and the limited available cargo unattractive in the long term. Many ship owners will not allow their vessels into the Gulf of St. Lawrence during the winter, particularly in February and March when the ice is at its worst. Ironically, it is the northern Europeans who are most adamant about this; ship owners in Hamburg, Oslo and Copenhagen will not allow it, or will demand a stiff charter hire premium. Most ships are not ice strengthened and it can be a needless risk for them. One major Great Lakes carrier has expressed the view that all year use of the Seaway is not feasible. The particular concerns are with icing conditions and experience with foreign crews on the Atlantic coast, and movements through the Gulf are considered risky.

## RELEVANT ISSUES FOR SPECIAL CONSIDERATION

Shippers have accommodated themselves to the navigation season on the Great Lakes and through the Seaway, and their transportation planning has been developed around it. How might freedom to use the System in winter affect these plans?

In the context of the present study, it appears from preliminary investigation that the question of winter navigation may be particularly important with respect to:

the eastward versus westward movement of Canadian grain;

the competitiveness of the Seaway as a conduit for U.S. grain;

cross lakes and intra lakes Ontario trade with the U.S.

### *Overseas General Cargo and Port Marketing*

The St Lawrence Seaway was, at least in the public eye, originally envisaged primarily as a channel for direct overseas general cargo commerce. This is an image that continues to be nurtured; the current brochure *The St Lawrence Seaway*, an excellent portrayal in other respects, features as its cover a loaded container ship.

Port management and governments supported organizations, devote a great deal of energy to the attraction of international traffic. This section discusses the prospects for, and the economic value of, such endeavours.

***Little or no container traffic moves into or on the Lakes, and this is not expected to change. Frequent service and fast turnaround of marine containers is paramount, and rail/truck delivery from ports such as Montreal can't be matched through the Seaway. The major competition for this traffic is between Canadian and United States ports on tidewater.***

***Two classes of foreign vessel come into the Lakes; national carriers countries (mostly east bloc) seeking hard currency, and vessels for project cargoes too large to move by rail or truck. The benefit to the Ontario and Canadian economy of foreign vessels capturing traffic that could be handled by domestic carriers of other modes is questionable. There is, therefore, no rationale for subsidizing these movements.***

***Ports see general cargo as generating more port revenue, more employment and the engine that drives the local economy, an overstatement at least. While there is an obvious link between port activity and jobs in the community, this relationship must be treated with caution.***

## GENERAL

Deep sea vessels operating into the lakes fall into three groups, *project vessels*, *hard currency vessels* and *tankers*. Project vessels are sophisticated ships with specialized features suitable for major project movements such as entire rolling mills, refineries or generating plants where a direct one port to one port move is mandatory. *Hard currency* ships are generally older general cargo ships owned by Third World or East Bloc countries whose principal aim is to generate revenue in U.S. dollars. Russian, Chinese and Romanian flags in the lakes are examples of this type of move.

The dominant *general cargo* commodity moved into and out of the Lakes is steel and steel products. This commodity moves in *shipload* quantities through a limited number of Lakes ports, and volumes are often high. Steel is not considered in the discussion of this section; rather the focus is on the prospect for container services.

## CONTAINER SERVICES INTO THE LAKES

There is almost no container traffic through the Great Lakes and St. Lawrence System beyond the container facilities at the Port of Montreal. Container services, generally a non-issue among most of those involved in Great Lakes St Lawrence shipping, are and are likely to remain an objective of some local interest, particularly in the United States. This traffic is generally more valuable than bulk cargo and, of course, more sensitive to time and reliability. It requires an established transportation system which operates year around on fast and reliable schedules. A number of combinations of North American rail carriers have such systems in place. These compete effectively with each other and with the highway carriers on price and time. No significant customers for container service into and out of the Great Lakes are apparent.

## FEEDER SERVICE TO MONTREAL OR HALIFAX

Coordinated railway operations move container trains from Canadian and U.S. eastern ports to central Canada, to the midwest and to the west coast. There does not appear to be much the Great Lakes and St. Lawrence System can do to compete. A container moves by rail from Montreal to Chicago in a day and a half, whereas the normal time by water through the Seaway is five days. Also, the costs developed for bulk products such as grain through the Seaway indicate that it only has a marginal advantage over rail; it is difficult to imagine how water transport of containers could be significantly cheaper than rail. Even movement from an inland port by foreign flag ship direct to overseas destination, although a handling is avoided, would be more expensive and require an order of magnitude more volume than available. Direct calls in the lakes do exercise a sales appeal but swift transit usually wins.

Slow moving feeder services in the lakes simply do not cycle empty or full containers fast enough, or reliably enough, and the risk of using leased containers is too expensive to accept[51]. Accordingly, rail and highway offer more acceptable and reliable service.

Where the competition does exist is between Canadian and U.S. salt water ports. The U.S. rail carriers are joining with the ports to reduce total distribution costs and attract container shipments away from Canadian ports. Traditionally, eastern Canadian ports have a cost advantage over their U.S. counterparts. This advantage has been reduced and, while not currently disadvantaged, the Canadian ports are finding U.S. ports more cost competitive.

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[51] Container movement is complicated by ownership and leasing arrangements. Containers are owned either by a steamship line or by a lessor. (There are shipper owned containers, but not in significant numbers.) Containers are frequently rented for a minimum of three or four months. If not returned in time, however, they become part of a master lease, usually subject to a minimum term of two years, as well as other conditions which vary, but usually are seen as unfavourable to the lessee.

Guideline factors for many steamship lines suggest that the final average cost for a leased container is about US$500 for three months, so they are reluctant to lease, since a new container until quite recently sold at about US$3,000 with a life of 5-10 years. This means that the logistics of containers are of major concern to steamship lines. If one of their containers is delayed, one must be leased and leasing is expensive, especially in the long term. If a leased container is delayed, it can result in unwanted and costly extension of the lease, as well as the cost of having to lease another.

For container movements on the west coast, where U.S. ports traditionally hold an advantage, land transport arrangements are also evolving. Double stacking is becoming prevalent and steamship companies are leasing trains with the railway providing a *hook and haul* service for the actual transportation. Thus the shipping line extends its control over the movement through local delivery. These are not trends that would favour a Great Lakes feeder service.

## GENERAL CARGO (CONTAINER) MARKETING

The preoccupation of port management, particularly within the U.S., with system marketing focused on general cargo, which for most commodities really must mean containers, remains an enigma. The research connected with the current study, particularly that related to cost, does not suggest much of a future for general cargo, with the exception of steel[52] and special dimensionally awkward cargoes, through the Great Lakes and St Lawrence Seaway system; nor has it had an illustrious recent past. There will be export cargoes where the buyer nation specifies direct water by its national shipping, and imports where direct water delivery by national shipping is part of the package.[53] There will always be cargoes of large machinery and equipment that are inconvenient or impossible to move by rail or road, and there will be (largely foreign aid) cargoes to (presumably third world) destinations not served by liners.[54] However, common carrier less than shipload carriage, either as a direct overseas liner service or as a feeder service to Montreal, Halifax or east coast U.S. ports, is most unlikely to be economically viable in the foreseeable future.

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[52] Steel, although defined and handled as general cargo, has many of the characteristics of bulk. Particularly, movements are generally shipload and of a homogeneous product.

[53] A trend away from the planned economy approach towards a more market/private enterprise orientation, and such is currently observable in eastern Europe, will also cause a trend away from this traffic.

The economic argument is straight forward. Retreading only slightly ground covered in Chapter 2, with Canadian or U.S. ships and crews the *long run variable* cost of the movement of bulk cargoes such as grain through the Seaway is only slightly lower than that for the rail alternative. At the margin, even grain traffic would seem to be at risk; with substantial possibilities for automation, rail can only get cheaper. General cargo, particularly containers, cannot be even close. This is on the basis of cost alone; service considerations --delivery time and frequency, and year around operation-- only add to the economic gulf. Foreign services utilizing cheap labour are difficult to categorically discount. However, labour is not expected to be a growing component of liner cost. Given the current non-viability situation, even with foreign ships and crews, and present trends, the balance of the evidence is strongly against such services ever becoming viable except under special and restricted circumstances.

There is, therefore, a strong economic argument against a growth in general cargo traffic into and out of the lakes, but one with a *small crack of possibility* in it. It is not sufficient to present the cost argument that augurs against expanded Seaway general cargo services; one must also explore other factors that could overwhelm the strength of this argument. The question arises; why do so many associated with ports discount a strong economic argument and focus so much effort (and money) on the *small crack*? It would seem that to deflate local port hopes for expanded general cargo and container traffic one must prove the hopes concerned are not merely improbable, but impossible. That can't quite be done.

Accepting the logic of a lack of interest, on the part of domestic carriers, in import/export general cargo into/out of the lakes, one can focus on two classes of candidate carriers.

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[54] Liner means regularly scheduled service. In the context of this study, liner generally means containerized.

The first is the very low cost operation with inexpensive vessels and third world crews. It is difficult to think of such vessels and operators expanding their operations in the lakes without attracting the attention of those concerned with pollution. Also, on a national economic basis, it must be noted that by avoiding the use of Canadian and U.S. ships and crews one also avoids *value added* to the domestic economy. It is difficult to argue for subsidized passage of such vessels through the Seaway, competing as they do with domestic railway and trucking activity. Indeed, there is a compelling argument for more than cost recovery tolls.

It is not possible to generalize on the domestic economic impact of a foreign flag presence in the System without certain information including:

the rates charged for such a service,
competing domestic surface (rail and truck) rates, and
the incremental competition provided by the foreign carriers.

There is a benefit to the extent that marine rates significantly below the domestic surface alternative[55] stimulate economic activity. There is a disbenefit to the extent that domestic transport sector employment is exported. One can, however, say that a marginal service, utilizing such vessels at no significant benefit to domestic shippers and/or receivers, does not warrant public support of ports and valuable real estate devoted to that purpose.[56]

The second class of vessel interested in Great Lakes general cargo is a variation on the first. In this case, foreign carriers (predominantly from the East Bloc) pursue business below cost to obtain hard currency. An obvious prerequisite for such motivation is a planned economy with exchange rates that don't truly reflect the relative values of various currencies to the government concerned. Participation of such carriers in Canada's domestic market is more complicated to assess than is that of the low cost third world crewed carriers discussed above. These carriers cannot really be separated from their usual cargoes or from the total package of commercial relations with the nation concerned. As above, the only real benefit accrues from competition between carriers which results in rates significantly below those for alternative modes and routes, and there is no *a priori* rationale for subsidizing the transits of these carriers through the Seaway or the port facilities that they use.

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[55] This would be expected to (only) occur under circumstances of active competition among water carriers.

[56] It can also be argued that these ships are picking up cargo owned by their flag and of no interest to anyone else (e.g. rails for scrap or re-lay).

General cargo (other than steel) in the Lakes is low volume; Montreal handled 6.9 million tonnes in 1988 while Toronto handled about 175,000 tonnes. General cargo operations provide revenue to the Great Lakes ports. They are also high cost in terms of port staff and capital facilities. It is unlikely that any general cargo (steel excepted) port operation on the lakes covers the port operation costs causally attributable to it, plus providing a reasonable return on the real estate and other capital assets, even costed on a *salvage value* basis.

The other important aspect of port operations is labour. General cargo is seen as generating more employment in ports than bulk cargo. More employment means more money in the local community (and a greater port visibility). The local impact of general cargo is greater than is bulk.

Ports Canada nationwide employed an average of 1,291 in 1988. Revenue per employee was about $312,000. The Port of Toronto generated an average of about $71,000 per employee, and most of that was from real estate revenue. Similar comparisons are not available for Hamilton and Windsor. It is interesting to note the level of job creation ascribed to various commodities handled at ports. Martin O'Connell, a United States based consulting company specializes in port impact studies. One such study, in 1988, assessed the economic impact of the Ports Canada system.

Direct Jobs Created for Each
1,000 Tonnes Handled at a Ports Canada Port

| Commodity | Jobs |
|---|---|
| Automobile | 2.67 |
| Break Bulk | 0.63 |
| Containers | 0.57 |
| Grain | 0.18 |
| Potash | 0.17 |
| Dry Bulk | 0.16 |
| Liquid Bulk | 0.12 |
| Coal | 0.09 |
| Petroleum | 0.06 |
| Ore | 0.05 |

Source: Presentation by John C. Martin, Martin O'Connell Associates to Ports Canada's Fifth Annual International Business Conference, June 13-15, 1989.

It should be noted that job creation refers not only to jobs at the port but also to jobs created in the community, with the carriers and, for example, ships chandlers, ship repair facilities, etc. This probably goes a long way to explaining why port managers want general cargo.

However, the assumption, that without the port activity the jobs created would be lost, would seem an overstatement, if not a fallacy. While the causal link between local job creation and port activity may be valid for certain bulk products, for example grain through Thunder Bay, it is suggested that this is rare for general cargo. For example, the small volume of general cargo handled at Toronto would, in all likelihood, find its way into the city or Metro via rail or truck from Montreal, Halifax or New York if the Port of Toronto didn't exist or couldn't handle it. Much closer, of course is the port of Hamilton. Local employment created by the delivery (modal) alternatives would exceed zero. Even if that particular traffic didn't move, alternative products would be imported, or perhaps produced locally.[57]

The type of *job creation analysis* shown above states the case of the local port authority. This is particularly necessary in the United States where ports are often creatures of the local community. As such, financing must be arranged locally, or regionally, and the impact of the port in the local economy is a major selling point. From a senior levels of government policy perspective, however, it must be seen as presenting a single side of an issue.

Ports promote general cargo traffic from a very local motivation. A port is, or at least is seen as, a major engine driving the local economy. Uneconomic ports may, like their railway branch line counterparts, be of only marginal value, but it is the perception that matters. A port is highly visible. A foreign ship loading or unloading is a visible sign of local economic activity, the more exotic the flag the better. The cargoes and destinations of trucks and railcars are rarely identifiable.

The above discussion is brief and oriented to the *emerging policy issues* perspective of the present study. The general topic of Seaway marketing is dealt with comprehensively in the study *Marketing the St Lawrence and Great Lakes Seaway System* completed for the Ministry of Transportation by Robert W. Savage Consulting Incorporated in November 1989.

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[57] Of course, this paragraph presents extremes. Steel into Hamilton, for example, would fall somewhere between the grain/Thunder Bay and general cargo/Toronto cases discussed here.

### *Cross Lake Operations*
### *Barge and Ro-Ro*

Over the years there have been several barge or ferry type operations on the Lakes. Traditionally, they were for bulk commodities or loaded rail cars, perhaps most notably for movements by rail car barge from U.S. Lake Erie ports to Canadian ports such as Port Stanley. The coal movements for home heating and for small to medium industrial users succumbed to a switch from coal to natural gas and oil. Traffic that continued moved by rail or truck but around the lakes.

With Ontario being the hub of Canadian manufacturing, and the bordering states being major components of the U.S. manufacturing industries, there is an immense volume of truck transport across the border. Probably the most important industry in this regard is automotive. The major automobile manufacturers use truck extensively for supplies, for inter-plant transfers and for delivery of finished product to market.

Recently, there has been much complaining about extensive delays at the Niagara and Windsor-Detroit gateways. Delays of several hours just to cross the international bridges have been reported. Also, major congestion is occurring on the highway system in Southern Ontario. It is understandable then that there should be renewed interest in a cross lake service. Much of the current interest, and there is interest, is for the movement of trailers loaded with automobiles and general cargo.

> ***Cross lake services have a distinguished past and perhaps an interesting future. Where once service was frequent, it is now extinct. Future possibilities include both tug and barge, and RoRo each with their own advantages and disadvantages. A shallow draft fast catamaran design is a possibility.***

***Lake Erie service may be less attractive than Lake Ontario service due in part to less favourable operating conditions. Marine economics and operations are relatively straightforward, these types of services exist elsewhere. The length of season, or lack of year around operation, could be a factor in selling to potential users of such a service. Marine economics are controlled more by operating costs than by capital costs.***

***Engineering economy analysis of hypothetical operations were inconclusive; profitability would depend on the usage of the system. The choice of site for such an operation would be crucial if trailer traffic is to be captured since out-of-line-haul to port or extensive drayage can quickly negate the lower cost of marine transport. Ultimate success is probably dependent on attracting several major industries or truckers as committed regular users.***

## BACKGROUND

A cross lake Ro-Ro operation between Oshawa and Oswego was initiated by Lakespan several years ago. The Province of Ontario provided start-up assistance. Once the Province's assistance ended, the operation failed. Several reasons for its demise have been offered by organizations contacted during the interview process including:

lack of marketing,
poor port access at Oswego,
the operation was only oriented to carrying trailers (no automobiles) and,
use of a foreign vessel gave the appearance of a temporary operation.

Recently, there have been other proposals involving cross lake operations. One such proposition, in 1988, envisaged a Ro-Ro operation between Toronto and a port in Niagara County, New York, probably in the vicinity of Olcott. A feasibility study was produced by a private organization that purported to show that such an operation could be commercially viable. To date, the service has not materialized although it is understood that the proposal is still active. One of the two examples which follow is an estimate of what such an operation would involve.

Woodlands Marine investigated the possibility of purchasing a surplus B.C. Ferries Services vessel and bringing it around and into Lake Erie to carry automobile traffic from the Ford plant at Talbotville via Port Stanley to a port on the U.S. side. Also, General Motors has investigated cross lake moves between Oshawa and the U.S. Major considerations include balanced flows and year around operation.

Automotive traffic within the area served by the Great Lakes and St. Lawrence System moves primarily by highway and to more distant destinations by rail. There have been proposals to move some of this traffic between the U.S. and southern Ontario by barge across Lake Ontario and Lake Erie. A Lake Ontario service could operate throughout the year while a Lake Erie service, at present, could not. This type of service could reduce, or at least slow down the increase in, traffic volume on congested portions of the Ontario highway system and, as a consequence, reduce the criticism that the auto producers are a major cause of that congestion.

Another consideration is that of distribution networks. At present Ford, for one, trucks to Detroit and the Niagara Frontier from Talbotville, and presumably from Oakville as well. The truckloads are received at major distribution centres set up to receive automobile models from several plants. The trucks are unloaded and return loaded with a mixture of models for delivery to dealers. This movement would generally be in the direction from which the trucks originated.

Strong factors mitigate against changes in the structure of automobile distribution. Truck rates on automobile traffic to small volume destinations are, to some extent, subsidized by rates on traffic to large centres. It is the latter which would move to a barge or Ro-Ro operation, so rates to the smaller centres would be expected to increase. A cross lake operation would require an investment or traffic guarantee from the shipper. This would involve a risk the industry does not bear using the highway or rail mode. One shipper suggested that support would be given to such a proposal if savings of at least a million dollars annually could be foreseen.

## ECONOMIC FEASIBILITY EXPLORATION

To provide some idea of the economic feasibility of cross lake barging or Ro-Ro operations, the following rough estimates were prepared[58]. While three Canadian ports have been previously mentioned, Oshawa, the home of General Motors, appears the most likely candidate at this time and has, accordingly, been used as the basis for the following estimates. The prospective United States port development location is Olcott.

The cost of providing a ferry operation, particularly the acquisition and/or construction of port and terminal facilities, is highly site specific. The figures presented here were developed without any site visit and little industry consultation. It is hoped, however that they will provide an illustration of the concept, and an order of magnitude understanding of the financial commitments, and hence risk that would be involved.

The successful development of any system would be greatly aided, perhaps even require, a firm commitment from one or more major shippers and/or connecting highway carriers to utilize the system. Independent truckers and other small operators could not generate the regular traffic needed for an economical trailer *drop-off* operation.

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[58] A University of Pennsylvania cross lake study was also analyzed. This analysis is summarized in Appendix F.

## Design Concept

The system, as presented here, is focused on doing a single simple job dependably, and doing it practically year around in all but the worst weather, but on a sufficiently small and economical scale that it becomes a realistic prospect financially. In some respects it can only really be considered a prototype of the kind of operations that might develop in the intermediate term future, should this modest beginning succeed. However, it is essential that such an initial operation succeed in its own right, and that it be of sufficient scale to make it worth the while of the shippers, actually connecting carriers, it wishes to attract.

Either pushed barges or a small ro-ro vessel would move between dedicated terminals on each side of the lake. It would be a relatively low cost service utilizing converted U.S. canal barges or a second hand vessel. Each terminal would consist of the necessary dock facilities and a fenced paved terminal of approximately 5 hectares, sufficient to handle loading and unloading, and storage for a maximum of some 200 trailers, with a modest combination office and gate house (including office space for customs officials). This would allow sufficient capacity for expansion should a preliminary venture meet success. The terminals would operate around the clock, seven days a week. Connecting highway carriers, common and/or private, would drop outgoing and pick up incoming trailers. Customs clearance would take place on site as part of the service provided, with off-loaded trailers remaining in-bond until a (hopefully scheduled for each vessel arrival) customs officer visit.

There are a plethora of possible equipment/financing/ownership possibilities. The following example is only intended to illustrate the range.

## Barges

Looking at the Oshawa-Olcott potential, it is probable that a pusher tug and single barge vessel configuration, with two other barges loading and unloading at each terminal, could prove economical operationally, and deliver sufficient trailers in both directions. While a tug and three barges would be the ideal configuration, the system would work with one barge, with others added as traffic warranted.

In simplest terms, the easiest economic acquisition is a *Gulf* barge which can be acquired for about US$400,000, and could be brought into the Lakes through the U.S. canal system. This is the standard barge measuring 250 feet by 42 feet by 7 feet, with a freeboard of about 9 feet, and able to carry a deck load of 1500 pounds per square foot. This type of barge could be modified to carry two or three decks of trailers (two were assumed for costing purposes) and should be able to load about 120 to 130 automobiles, 36 trailers or a combination of the two. All trailers is assumed. The 36 trailer figure presumes a drop-trailer operation. Transport of rigs and trailers would be technically possible, but the barges are assumed uncrewed and without facilities to provide for the safety of drivers.

The barges could be modified at an estimated cost of US$175,000 each; that added to delivery costs of US$25,000 would give a capital cost of US$600,000 per unit or US$1.8 million for the system. Using a *real* before tax cost of capital rate of 9%, with capital recovery over five years, it would be necessary to generate about US$460,000 annually to cover the three barges; two barges would of course be less, and capital recovery over more than five years would yield a lower annual figure.

These are, of course, estimates based on current conditions which should be studied in the light of new construction possibilities, and any subventions which could apply, or the possibility of purchasing closer to home. It is assumed that ice strengthening is not required.

## Barge and Ro-Ro Comparisons

The barge system is cheaper and, as mentioned above, has the advantage of being expandable in smaller increments, that is it can develop from one to three barges in stages as demand for the service dictates, whereas a single Ro-Ro vessel is the system, and the commitment to it is total.

Realistically, the barge system is slower, about 8-10 knots compared with 13-15 knots for a Ro-Ro operation. This may not be a factor in the movement of automobiles as freight, but it is a negative factor in the movement of trailers; unless three barges are obtained. In this case, one barge could be left at each terminal for loading/unloading while the tug moved the third barge across the lake. The convenience of such an operation, and its effect on loading/unloading cost would be important. This would also reduce the turnaround time for the tug, and could make it speedier than RoRo.

Without other trailers the system becomes totally reliant on GM and any swings in auto sales would impact operations unpleasantly. Also, the trailer business offers backhaul potential while GM probably does not, at least on a continuing basis (currently, there is a potential movement of light trucks back across the lake). Current estimates of GM traffic suggest a solid southbound potential of about 72,000 vehicles. This would equate to about 8,000 loaded auto racks per year at 9 cars per rack. Accordingly, it is assumed that all traffic is in trailers. Oshawa operations would certainly place an emphasis upon traffic from General Motors but the operator could not afford to be restricted to only one customer. Other traffic must be obtained.

While the costs are based on a 320 day period, it is possible, depending on the degree of dependence on GM, that traffic volumes would vary considerably and operations would only be carried out on a 275-300 day basis since GM, from time to time, has production stoppages for various reasons including poor sales, retooling for new models and occasionally for strikes. These and other factors, such as severe storms, reduce annual operating time.

## Preliminary Operations Cost Estimates

The *tug and barge* and *ro-ro* alternative systems portrayed below vary in a number of characteristics that, while compatible with the vessel type chosen, are not always strictly dependent on it. Some, particularly those related to the turn around cycle, are more characteristic of that rhythm than of the vessel type. Characteristics of the systems examined are:

| | **Tug and Barge** | **Ro-Ro** |
|---|---|---|
| Round Trips Daily | 3 | 2 |
| Crewing | eight hour shift | two crews with change every two weeks |
| Crew compliment | 3[59] | 9 |
| Capacity | 36 forty foot trailers | approximately 70 trailers |
| Docking facilities each end | two slips with elevated ramp; berth for tug | one slip with elevated ramp |
| Vessel Arrangements | barges - owned<br>tug - time charter | bareboat charter |

On the above bases, the following operations costs are calculated.

Note: Forty foot trailers were assumed to simplify calculations. General Motors, for example, uses 45 foot and 48 foot trailers.

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[59] A fourth crew member may be necessary.

On the above bases, the following operations costs are calculated.

### Tug and Barge - Oshawa to Olcott

| | | US$/year |
|---|---|---|
| One 700 to 1000 hp tug (time charter) | | 900,000 |
| Fuel | | 200,000 |
| Barges, amortized over 5 years | | 460,000 |
| Insurance (Based on latest Lake quotes) | | 25,000 |
| Two tractors @$85,000, amortized over 5 years | | 50,000 |
| Terminal operating labour (8 shifts of 3) | | 1,000,000 |
| Terminal Maintenance | | 100,000 |
| Administration | | 200,000 |
| TOTAL | US$ | 2,935,000 |
| Per Day costs @320 days per year | US$ | 9,200 |
| Cost per 40 Foot Trailer Capacity | US$ | 43 |

### Ro-Ro Oshawa to Olcott

| | | US$/year |
|---|---|---|
| Bareboat Charter @ US$4,500 X 360 | | 1,620,000 |
| Crewing, victualling, etc. @ US$3,000 X 360 | | 1,080,000 |
| Misc. ship supplies | | 100,000 |
| Fuel | | 250,000 |
| Six tractors @$85,000, amortized over 5 years | | 150,000 |
| Terminal operating labour (6 shifts of 3; 8 shifts of 1) | | 1,080,000 |
| Terminal Maintenance | | 40,000 |
| Administration | | 200,000 |
| TOTAL | US$ | 4,520,000 |
| Per Day costs @320 days per year | US$ | 14,100 |
| Cost per 40 Foot Trailer Capacity | US$ | 50 |

## Terminals Capital Costs

The capital costs for terminals in Olcott and Oshawa, if that is where they would really be (for this rather abstract example), are separated from the operations costs for two related reasons. First, the cost numbers on the above are very approximate. The terminal capital cost that an operator (carrier), as described above, would have to cover could vary much more widely. Second, the unit operations costs, described above, are already high relative to the market that must be faced, specifically direct trucking around the Lake. A load factor of 50% to 60% would yield an operations cost of US$ 80 to 100 per forty foot trailer. Clearly, if there is to be any hope of economic viability, charges for terminal capital must be modest.

An entrepreneur might be expected to face the above situation by approaching others, particularly government, to negotiate for someone else to bear at least some of the cost of terminal investment. In this regard, there are arguments that could appeal to local communities, essentially local employment (even though the direct trucking alternative is more labour intensive, the employment lost might not be local or it might not be visible). From the perspective of the present study, the only support argument that might be entertained would be reduced wear of and congestion of the highways.

Rather than looking from the general *who pays* approach, however, the figures below are developed from the perspective of getting the necessary job done with a minimum of initial terminal investment. For example, not all of the 5 hectare terminals areas need to be paved initially and, relatively steep ramps for upper deck loading could be acceptable. Also, some facilities may already exist, for example at Oshawa, and only require modification.

The figures below are most approximate. In general, barge facilities would probably require greater expenditure since duplicate docks would be required on each side. However, water depths required would be less, and with a three barge system, greater loading inconvenience could be tolerated.

**Capital Cost Shore Based Facilities**

| | Barge | RoRo |
|---|---|---|
| | US$ | |
| Land | 2,000,000 | 2,000,000 |
| Grading and Paving | 200,000 | 250,000 |
| Ro-Ro, Tug, Barge Berths | 1,000,000 | 600,000 |
| Ramps to Upper Levels | 800,000 | 500,000 |
| Dredging | - | 100,000 |
| Bubble System | 200,000 | 100,000 |
| Office | 50,000 | 50,000 |
| Lighting and Fencing | 50,000 | 50,000 |
| Engineering and Contingency (20%) | 860,000 | 730,000 |
| TOTAL | **5,160,000** | **4,380,000** |
| Annual Cost (8% real before tax cost of capital over 20 years) | **US$ 525,500** | **US$ 446,100** |
| Cost per 40 Foot Trailer Capacity | **US$ 8** | **US$ 5** |

The above suggests total costs per 40 foot trailer:

| | | |
|---|---|---|
| **Barge** | **US$ 51** | **C$ 60** |
| **Ro-Ro** | **US$ 55** | **C$ 65** |

Given the lack of precision of the cost estimating process used, these figures are too close for any conclusions with respect to preference for a particular alternative. With respect to the economic viability of the *cross lake* concept generally, they are more interesting. As always, viability would depend on the carrier's ability to fill a significant portion of available capacity at a remunerative toll.

Presuming a year-around load factor of **60%** a toll of **US$ 85 to 92** would be necessary to achieve economic *break-even*.

Avoidable truck travel is roughly 100 miles at US$ .90 per mile or **US$ 90** per trailer. To this should be added $ 30 per trailer hour for any congestion caused delay[60]. Overall then, a cross-lake service would only seem viable were the carrier able to achieve a load factor of at least 60%, and provide a quality of service that enhances the operations of connecting carriers.

## PROSPECTS

In addition to the factors considered in this analysis, there are undoubtedly others which would merit consideration in the determination of whether a cross lake operation would be viable. First and foremost would be the willingness of someone to use it, or be convinced to use it. Second, the around the lake avoidable movement is reduced the farther away a shipper/receiver is located from the lake. The logistics of pick up and delivery of trailers at the respective ports should also be considered.

Also a potential factor in the future, but not explored in the current analysis is the interest internationally, particularly in Japan, in higher speed ferries. A catamaran design, suitable for shallow and therefore economical berths, and capable of speeds of 25 to 30 knots, could improve the economics discussed here appreciably. It is, in the context of the present study, an entrepreneurial possibility, not a policy concern for Ontario.

As stated earlier, one major shipper would be interested in a cross lake service if substantial savings would accrue ($1 million per year). This is probably the case with other potential customers, they need a reason to change from what works now. The bottom line then is not matching around the lake trucking costs but rather in providing a dependable alternative service that reduces the customers total distribution cost.

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[60] Multi hour delays at the Niagara border crossing have been reported. Of course, delays can be avoided by using other crossing points, particularly Ivy Lea, but the distances to most destinations would be greater.

This very preliminary analysis has focused on possible cross lake services from the point of view of the cost of service and from relating these costs to around the lake avoidable costs. The whole issue of operating costs between origin/destination and port facility has not been considered. Clearly, these costs and operations are just as important to the consideration of the feasibility of a cross lake operation. They warrant more comprehensive consideration than is possible in this study of the Great Lakes/St. Lawrence System generally.

# CHAPTER 4

# REVIEW OF SELECTED LEGISLATION

Transportation on the Great Lakes/St. Lawrence System is affected, sometimes controlled, by statutes and regulations that establish the conditions under which commerce is carried on. These are generally at the federal level, both Canadian and American. In addition to the conditions established by these governmental pronouncements, the competitiveness of the system is also affected by statutes and regulations that only have an indirect relationship to Great Lakes transport but affect other modes, particularly rail, thereby affecting the volume of traffic on the Great Lakes/St Lawrence.

This section briefly discusses the *Canada Shipping Act* which sets the ground rules for coastal shipping as well as other legislation with important indirect effects on the Great Lakes/St Lawrence System. In addition, Appendix G provides a listing of Government of Canada statutes that have both a direct and indirect impact on commerce on the System.

Grain is not only the most important but the most regulated commodity carried on the System. In regard to this commodity, two existing statutes and one proposed statute, affecting grain movement through the Great Lakes/St Lawrence, will be briefly described.

> ***Of particular importance to the Great Lakes/St Lawrence and to the Ontario shipping industry are: The Canada Shipping Act and provisions for Flag Waiver, the U.S. 'Jones Act', the Western Grain Transportation Act, the At and East grain and flour subsidy program, and the Maritime Freight Rates Act and Atlantic Region Freight Assistance Act subsidies program.***

## COASTING TRADE

The *Canada Shipping Act* sets the conditions under which vessels can operate within Canadian waters. Commerce within inland waters west of Anticosti Island, including the Great Lakes, is reserved for Canadian vessels except when a permit is obtained from National Revenue, Customs and Excise. All foreign vessels operating in the coasting trade must pay a duty of either 20% of value (U.S. owned vessels) or 25% of value (other foreign vessels). This duty is contained in the *Customs Tariff*. British registered vessels do not require special permission to operate in the coasting trade except in the inland waters described above. They must, however, pay the 25% duty.

For vessels not imported on a permanent basis, Revenue Canada can issue an "Authorization for Flag Waiver and Partial Remission" which permits the use of a foreign vessel in this trade. The process essentially consists of an application to the National Transportation Agency, review by the NTA and, if no suitable Canadian vessel is found by the NTA, a recommendation to National Revenue to permit entry. National Revenue then charges a reduced duty (collected in advance) amounting to 1/120 of 25% (20% if U.S. vessel) of fair market value of the vessel for each month the vessel is allowed to operate in the coasting trade. The "Authorization" specifies the length of time for which the vessel is allowed to operate in Canadian waters.

National Revenue requests an *Order in Council* quarterly to obtain formal approval of the reduced duty for all vessels allowed into the coasting trade during the previous quarter. The Order in Council has always been issued. Other issues related to the temporary importation of foreign vessels include the importation of foreign crews (mandated to Employment and Immigration) and the safety standards of these vessels (Transport Canada, Coast Guard).

The *Offshore Customs Application Act* extends the duty on foreign vessels to the 200 mile limit. Movements between Canada and the U.S., even within the lakes, are considered to be international commerce. There is one interesting sidelight which relates to the Kiisla.[61] Since this vessel has operated on the lakes for an extended period of time, National Revenue may consider whether this vessel is based in Canada. If so it could be charged the full import duty of 25% and perhaps require a Canadian crew. This issue is sensitive since, according to Revenue Canada, Canadian unions picketed the Kiisla when it was first allowed in.

The *Canada-U.S. Free Trade Agreement* provides for the elimination, over a ten year period, of duty on ships built in one country and used for trade in the other country (the non-tariff barrier of flag waiver will remain). This has raised concerns among Canadian shipowners that surplus U.S. built 1,000 foot lakers could be used in the upper lakes for domestic Canadian trade such as coal from Thunder Bay to Ontario Hydro. These vessels have double the carrying capacity of a Seaway class vessel with a similar sized crew.

The *Merchant Shipping Act* (Jones Act) in the U.S. requires that ships operating in the coasting trade must be U.S, built and the company operating them must be 75% owned by a U.S. citizen or citizens. The comparable provisions in Canada (*Canada Shipping Act*) require ownership by a Canadian citizen or corporation (included are Canadian subsidiaries of U.S. corporations). Therefore, Canadian shipowners want harmonization between the two countries' ownership provisions. Transportation was excluded from the Free Trade Agreement but, since the restrictive U.S. provisions of Jones are in place, Canadian shipbuilders and carriers will be at a disadvantage competing with their U.S. based (and owned) counterparts unless Canada enacts similar provisions to Jones, or the U.S. loosens up its laws.

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[61] As mentioned earlier in the report, the Kiisla is a Finnish flag tanker that operates between Sarnia and U.S. lake ports on a year round basis.

In the previous session of Parliament, Bill C-52 (the *Coasting Trades Act*) was introduced to remove the coasting trade from the *Canada Shipping Act*. Included in the provisions were sections to clarify that it applied to the 200 mile limit and that operations such as drilling rigs and dredges are covered. Also, the British preference was to be ended. This Bill did not pass but is likely to be reintroduced soon.

## WESTERN GRAIN TRANSPORTATION ACT

The *Western Grain Transportation Act*, enacted in 1983, replaced the rate provisions contained in Section 271 of the *Railway Act*. These latter rates (mandated by the *Railway Act* since 1925) were essentially the **Crow's Nest Pass** level of rates. In 1925, the low rates on grain that had applied to Thunder Bay (then Port Arthur and Fort William) from points on the CPR in 1897 were extended to apply between all rail origins west of the lakehead to the lakehead (domestic and export), and to the west coast (export).[62] The rates remained unchanged between 1925 and 1983 except for a small number of localized adjustments for changes in railway mileage and for competition between railways.

In the late 1970's the federal government appointed a well known U.S. consultant to investigate railway allegations that they were losing hundreds of millions of dollars annually in the carriage of statutory grain. In 1982, the Minister of Transport appointed an agricultural economics professor from the University of Manitoba to consult and make recommendations for the establishment of a "... comprehensive and financially sound framework..." for the western grain transportation system. He carried out his mandate and produced a report[63].

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[62] The basis of rates to the west coast was established with *General Order 448* of the Board of Railway Commissioners dated August 26, 1927.

The government then established several task forces to develop the framework within which new legislation was to be developed. One of these, the Task Force on Rates, was charged with developing a "distance-related rate scale"[64] which was incorporated as Schedule II to the *Western Grain Transportation Act*. The new rate scale was very close to the rate levels prevailing under the previous *Railway Act* provisions. Of particular importance - the Schedule II rates only applied to the shipper of grain, the balance or government rate (also referred to as the "Crow Benefit") would be paid to the railways by the federal government. Also, both the shipper's rate and the government rate would increase over time.

The WGTA, when passed, as well as incorporating the rate scale,[65] included most of the rate related recommendations made by the Task Force on Rates. The railways would be entitled to a (phased in) contribution to constant costs equal to 20% of volume related variable costs for carrying this traffic. The effective rates would be adjusted on August 1 each year, coincident with the beginning of the crop year. With the rates divided into two portions, the Government rate is, in reality, the subsidy payment mechanism and is paid directly to the railway companies by the National Transportation Agency upon verification of claim. It, therefore, does not enter into shipper decision making on grain routings. The table below illustrates the proximity of Schedule II rates to those existing under the *Railway Act*.

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[63] Gilson, J.C., *Western Grain Transportation - Report on consultations and recommendations*, Minister of Supply and Services, 1982. This report included the recommendation that, over time, the burden of paying for western grain rail transportation should shift to the shipper to a limit of 81% of the total with the Federal Government paying the balance. This recommendation was essentially incorporated in the early drafts of the WGTA but was later changed to the present system because of opposition from the prairie grain pools and feed grain consumers in the Province of Quebec.

[64] Terms of Reference - Task Force on Rates, August 30, 1982.

[65] This is the rate structure developed and should not be confused with the method of payment.

Comparison of WGTA Schedule II Rates
with the Railway Act, Section 271 Level of Rates

| Variation | Percent of Total Tons<br>CP Rail | <br>CN Rail |
|---|---|---|
| Within 1 cent per 100 pounds | 91.8 | 92.0 |
| Within 2 cents per 100 pounds | 98.5 | 99.0 |
| Within 3 cents per 100 pounds | 99.4 | 99.5 |
| Within 4 cents per 100 pounds | 99.6 | n/a |
| Within 5 cents per 100 pounds | 100.0 | 100.0 |

Source: Report of the Task Force on Rates, 1982.

To illustrate, several scale rates have been selected at increments of 400 miles for distances from 400 miles to 2,000 miles. Rates have been taken from the levels existing on CP Rail and CN Rail prior to the WGTA, from the Task Force exercise described above, and from Schedule II to the *WGTA*.

| Distance | Crow's Nest Pass Level | | WGTA | |
|---|---|---|---|---|
| | CPR | CNR | | |
| Miles | c/cwt | c/cwt | c/cwt | c/tonne |
| 400 | 14 | 14 | 14.36 | 317 |
| 800 | 20 | 21 | 20.18 | 445 |
| 1,200 | 26 | 26 | 26.01 | 573 |
| 1,600 | 35 | 35 | 34.83 | 768 |
| 2,000 | 44 | 44 | 43.77 | 965 |

Source: Report of the Task Force on Rates, 1982.
Schedule II to the Western Grain Transportation Act.

Schedule II was calculated on the basis of cents per hundred pounds and then converted to cents per tonne to ensure consistency with grain industry metric practice. The rates implemented on January 1, 1984, while based on Schedule II, were escalated from the Schedule II level (which was, in reality, only the shipper share) to meet the rail variable costs anticipated.

Since then, the rates have been escalated annually and in the 1989-90 crop year are 23.5% higher than those implemented on January 1, 1984. It is noted that, even though the shipper's share of the total freight charges rose faster than the government share between 1984 and 1989-90, it still only amounted to less than 30% of the total, far below the Gilson proposal of 81%. The table below provides a comparison based on a representative distance of 800 miles to port.

Western Grain Transportation Act[66]
Rates for a Haul of 800 Miles

| | Shipper Rate $/tonne | % | Government Rate $/tonne | % | Total $/tonne |
|---|---|---|---|---|---|
| January 1, 1984 | 5.25 | 23.3 | 17.27 | 76.7 | 22.52 |
| August 1, 1989 | 8.26 | 29.7 | 19.55 | 70.3 | 27.81 |

Source: Tariff CFAW 4310

## AT AND EAST RATES ON FLOUR AND GRAIN

The second element of grain related legislation pertains to railway carriage of bulk grain and flour. For many years, the railways had maintained low rates on export grain and flour to discourage movement through eastern U.S. ports. At the time of the McPherson Royal Commission, the railways complained about losses incurred carrying grain in western Canada. They were reminded of the low export rates in eastern Canada that they had established voluntarily. The railways then costed this traffic and attempted to raise the rates. This led to complaints to the Board of Transport Commissioners for Canada and subsequently to the Governor in Council.

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[66] The National Transportation Agency has publicly announced a reduction in the producer freight rate for 1990-91. As for 1989-90, this rate was based on that Agency's reduction of the Grain Transportation Agency's crop forecast. Last year's NTA action was not confirmed by the Government. This year's more publicized action (in support of the farmers) by the Agency could also be overruled. If it is not, the competitive position of the Great Lakes/St Lawrence will be further undermined.

The rates were then *frozen* by a series of Orders in Council and later included in the *Railway Act* (1967) as section 272. In the *Railway Act*, the rates were frozen at the levels in effect on November 30, 1961 (grain) and September 30, 1966 (flour). A subsidy was authorized to compensate the railways for the difference between the frozen rates and compensatory rates. To receive the subsidy, certain conditions had to be met.[67] In recent years this program has provided the railways with $30-40 million in subsidy payments annually. It has also maintained traffic through elevators at inland points and at Halifax and Saint John.

It was announced in the February 1989 budget speech by Michael Wilson that this program was to be ended. Accordingly, Bill C-26 was introduced for first reading in 1989. While it is clear that the subsidy payments would end with the passage of this Bill, it is not clear that the railways would be legally able to raise the rates.[68] The Bill has now progressed to second reading.[69]

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[67] The grain had to be received by water at "inland points" (generally ports on Georgian Bay and on the lakes and rivers east thereof up to Prescott, Ontario). Only points with frozen rates were eligible. In the case of flour "inland point" was defined as "... any point in Canada east of the 90th degree of west longitude", which is west of Thunder Bay. Export had to be through an "eastern port" ('Halifax, Saint John, West Saint John and Montreal and any of the ports on the St Lawrence river to the east of Montreal').

[68] If the "frozen rates" are retained, with or without subsidy, movement by rail and the inefficient use of modes of transport will undoubtedly continue well into the future.

[69] Notwithstanding this, the railways have filed new compensatory rates. The National Transportation Agency accepted the filing of these tariffs despite their questionable legal status. Since then, shippers have been obliged to pay the higher tolls, even though with the Bill not yet passed there is no legal authority for such rates.

## ATLANTIC REGION FREIGHT ASSISTANCE PROGRAM

This program consists of two Acts, the *Maritime Freight Rates Act* (MFRA) and the *Atlantic Region Freight Assistance Act* (ARFAA), and several related Regulations. The MFRA, enacted in 1927, resulted from the report of the *Duncan Royal Commission* which had investigated claims by the Maritime Provinces that they had been guaranteed access to the central Canadian market as part of the agreement to join in the Canadian Federation. Part of the problem of access was the long distance to market, made even greater by the circuitous routing of the Intercolonial Railway (now part of Canadian National) which was built remote from the U.S. border in case of invasion.

*Duncan* recommended a reduction in the level of freight rates for rail freight movements from the Maritime Provinces (New Brunswick, Prince Edward Island and Nova Scotia) to central Canada. When the legislation was drafted, that part of eastern Quebec, south of the St. Lawrence River and east of Diamond and Levis (across the river from Quebec City), was also included. The Act requires Canadian National to reduce rates. Other railways can voluntarily reduce rates in return for the government subsidy. Under the *Terms of Union* with Canada, shipments from Newfoundland were also included under the program.

As transportation systems evolved, trucking became a more important part of transportation from the Atlantic Provinces and, accordingly, the ARFAA was enacted in 1969 to include truck movements in the subsidy mechanism.

There are two separate and distinct parts to the program, that part which applies only within *Select Territory* (Intra Program) and that which applies between *Select Territory* and central Canada (Westbound Program). The *Intra* Program provides a subsidy of 10% on the movement of certain commodities grown, harvested, mined or processed in *Select Territory*. The program applies to movement within *Select Territory* by rail, rail express, water or truck. Most traffic moves by truck. Trainloads of potash from the Sussex area to Saint John for export receive this subsidy.

There are essentially two parts to the Westbound program. The first, the basic westbound, applies to all commodities (grown, mined, etc.) and provides a 30% subsidy on that part of the movement occurring within *Select Territory*. The second, the selective westbound, provides a further 20% subsidy on certain commodities. Potash is included in the list of selective commodities.[70] The westbound program applies to movements by rail, rail express (MFRA and ARFAA), or truck (ARFAA). The westbound program does not apply to movement by water although the MFRA does allow for rail-lake movements.

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[70] Please refer to discussion of freight rates on potash in Chapter 2.

# CHAPTER 5

# INFRASTRUCTURE COSTS, FINANCING AND ADMINISTRATION

The cost and traffic conclusions developed in Chapter 2 are extended to an examination of institutional factors. This examination touches on several policy issues of potential interest to the Province of Ontario. However, it is not intended that the present analysis proceed beyond identification of such issues and relevant perspectives on them.

***Canadian expenditures on Great Lakes/St Lawrence infrastructure, ports excluded, amount to approximately $ 120 million annually, of which some two thirds is covered by user charges. Seaway tolls and pilotage fees, ranges from nil to approximately 15% of total transportation cost, depending on facilities usage. Recovery of Canadian Coast Guard costs would amount to $1/tonne of cargo moving through the Seaway. Full recovery of all infrastructure costs could add up to one third of Seaway vessel operating costs.***

***Cost recovery does not necessarily contribute to equal treatment of modes and economic efficiency. Charging traffic for the fixed cost of infrastructure provision could lead to inefficient modal choice. Many ports are locally financed. The diversity of federal port organizations and environmental and development pressures for rationalization suggest that port policy will be an intermediate term issue.***

***In lieu of formula based toll schedules, market based revenue generation schemes should be studied. Efficient fixed cost recovery should not create disadvantage to Great Lakes/St Lawrence transportation relative to***

***its route and modal competitors. The particular danger is the loss of Canadian and U.S. export grain traffic.***

***If full or enhanced cost recovery is to be implemented, the management structure for the provision of St Lawrence/Great Lakes Infrastructure services warrants review. A unified management would allow a more commercial orientation and more effective user participation.***

### *Great Lakes/St Lawrence System Infrastructure Costs*

A consistent set of Great Lakes/St. Lawrence System infrastructure cost data is not generally available.[71] To obtain an approximate estimate of the sums involved, the St Lawrence Seaway, pilotage and the responsibilities of the Canadian Coast Guard are considered in this section. Ports, not under the mandate of the Coast Guard, and information related to their cost are considered separately.

***Great Lakes/St Lawrence Infrastructure costs attributable to commercial traffic include:***

| | |
|---|---|
| ***St Lawrence Seaway Authority*** | ***$61.5 million*** |
| ***U.S. St Lawrence Seaway Development Corporation*** | ***$10.1 million*** |

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[71] For this study, it was necessary to obtain data from a variety of sources and adjust them towards a reasonable approximation of costs relevant to the policy purposes of the study, particularly considerations of the recovery of costs incurred by the Canadian federal government. In this regard, U.S. incurred costs are not considered. Attempts were made to obtain comprehensive data on ports, the Seaway, Pilotage Authorities and the Canadian Coast Guard. This effort met with mixed results. Reasonably good information was obtained on the Seaway, the Pilotage Authorities and to a limited extent the Coast Guard. Much poorer information was available on ports, particularly Commission ports. These latter Crown Corporations, as a general rule, do not divulge much information publicly.

| | |
|---|---|
| *Great Lakes Pilotage Authority* | *$9.7 million* |
| *Laurentian Pilotage Authority*[72] | *$28.7 million* |
| *Canadian Coast Guard* | *$40.9 million.* |

*Also warranting consideration are U.S. Coast Guard and Corps of Engineers expenditures.*

## ST. LAWRENCE SEAWAY

The Seaway recovers costs via the toll mechanism. Generally speaking, toll revenue covers operating costs but not capital costs. In the past, the Canadian Government has written off considerable amounts of Seaway capital cost. Following the collapse of a wall in the Welland Canal, the Federal Government approved a grant to the Seaway for $175 million to be spread over seven years for the renovation of the Welland Canal.

Operating costs of the Seaway in 1987 are given in the table below. At present, the St Lawrence Seaway Authority charges three different tolls based on 1) the gross registered tonnage of the vessel, 2) a lockage charge (Welland only), and 3) a cargo toll which varies with the type of cargo carried. The proportion of the tolls that goes to the St Lawrence Seaway Development Corporation (27% of MLO tolls in 1987) is rebated to the carriers.

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[72] Only a small portion applies to Great Lakes/St Lawrence traffic.

## St Lawrence Seaway System
## 1987 Operating Costs

$ millions

| | St Lawrence Seaway Authority | | St Lawrence Seaway Development Corporation |
|---|---|---|---|
| | MLO | WELLAND | MLO |
| Operating | 6.20 | 10.47 | 1.66 |
| Maintenance | 10.35 | 11.91 | 2.65 |
| Administration | 4.82 | 5.10 | 1.74 |
| Headquarters | 3.97 | 4.86 | na |
| Depreciation | 4.37 | 5.64 | 2.06 |
| Empl Term Benefits | 0.75 | 1.01 | na |
| Other Expenses | 0.97 | 0.08 | 1.95 |
| **TOTAL** | **31.44** | **30.08** | **10.06** |
| **TOLL REVENUE** | **25.95** | **29.68** | **9.53**[73] |

Source: St Lawrence Seaway Annual Report 1987-1988.
St Lawrence Seaway Development Corporation Annual Report, 1987.
St Lawrence Seaway 1987 Traffic Report.

The cargo toll is an attempt to introduce market oriented pricing. This would seem a concept that warrants extension. It is a logical approach to recovering what is essentially a constant cost, without forcing marginal traffic (that could recover its incremental cost and provide some contribution to constant cost, but could not cover an average total cost allocation) off the system. Greater pricing flexibility for the authority, such that it can sell its services, including priority handling, and recover as much cost as possible without traffic loss, is an important policy consideration.

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[73] This figure is in $US. The tolls represented by this revenue are rebated to the carriers.

## PILOTAGE AUTHORITIES

Traffic on the St Lawrence River and the Great Lakes is subject to the jurisdiction of two pilotage authorities; the Laurentian Pilotage Authority (LPA) and the Great Lakes Pilotage Authority (GLPA). The objectives of these Authorities are:[74]

> to establish, operate, maintain and administer, in the interest of safety, an efficient pilotage service within their respective regions; and
>
> to prescribe tariffs of pilotage charges that are fair and reasonable, and that provide revenue sufficient to permit each authority to be financially self-sustaining.

The LPA, a Schedule C-1 Crown Corporation, oversees vessels traversing the St Lawrence river from Les Escoumains to Montreal and the Great Lakes Pilotage Authority (a wholly owned subsidiary of the St Lawrence Seaway Authority) oversees vessels upstream from Montreal. Carriers have expressed concern with the level of pilotage charges and with the costs incurred by the Authorities, particularly with respect to salaries and pilot work loads. Any vessel requiring a pilot must pay the associated pilotage fee. From this fee the Authority pays pilots and covers other operating costs. Authority revenues and costs for 1988 follow.

The LPA incurred operating losses exceeding $1.3 million in each of the last 5 years. The GLPA experienced both operating profits and losses during the same period with an average annual operating loss of about $0.8 million. When the Authorities experience operating losses, Transport Canada provides financial assistance. In 1987-88 assistance in the amount of $1.5 million and $ 1.0 million was provided to the LPA and the GLPA respectively. In its Corporate Plan for 1990-1994, the LPA forecasts an operating loss of over $1 million in 1990 with operating profits increasing from $218,000 in 1991 to $805,000 in 1994. The GLPA forecasts a minimal operating profit of $10,000 each year from 1990 to 1994.

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[74] Source: 1989-90 Estimates, Part III.

## Pilotage Authorities Revenues and Costs 1988

$ millions

| | Great Lakes Pilotage Authority | Laurentian Pilotage Authority |
|---|---|---|
| Revenue | 9.75 | 26.95 |
| Operating Costs | 9.72 | 28.72 |
| Operating Profit(Loss) [75] | .28 | (1.77) |

Source: Great Lakes Pilotage Authority Annual Report, 1988.
Laurentian Pilotage Authority Annual Report, 1988.

Intertwined with the level of charges assessed for pilotage is the issue of the necessity of using a pilot. Obviously, as charges rise resistance to the use of pilots rises also. Lakes carriers have objected to the need to use pilots in waters that they believe are as familiar to their navigators as to the pilots. The GLPA exempts Canadian masters of Lakes vessels; the LPA does not. Also, relations with the United States and its pilots have become a thorny issue, particularly with respect to salty-lakers. The International Association of Great Lakes Ports (IAGLP) is also on record as being opposed to any action concerning pilotage that will result in additional cost to the users.

## CANADIAN COAST GUARD

Responsible for several important aspects of maritime activity, most notably navigation aids, icebreaking and marine search and rescue, the Canadian Coast Guard covers all areas of Canada where these services could be required. Accordingly, it is a large organization (combined with Marine Transport) accounting for 6,073 person years and almost $600 million in operating expenditures in 1987-88.[76]

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[75] Since pilotage authorities have a minimal capital structure (they provide a professional service), there would be very little difference between the Operating Profit(Loss) shown in the annual report and a before tax profit shown by most corporations in their financial statements.

An analysis of Coast Guard expenditures, broken down into five main parts which parallel the respective sub-activities developed by Transport Canada for the annual *Estimates* process, and their attribution to Central region is given in Appendix G.

The total estimated operating and maintenance expense for the Coast Guard/Marine operation attributable to Central Region is estimated as:

**Canadian Coast Guard Expenditures**
**Attributable to Central Region**

| | Expenditure $ 000 |
|---|---|
| Marine Navigation Systems | 37,200 |
| Icebreaking and Arctic Operations | 3,200 |
| Marine Regulatory | 2,200 |
| Marine Search and Rescue | 9,600 |
| Public Harbours and Ports | 9,500 |
| **TOTAL** | **61,700** |

The regional expenditures estimated above must be apportioned among the components of Central Region, and among beneficiaries of the services provided. The three main components of marine activity; commercial, fishing and recreational, should all share in this apportionment, as should Lake Winnipeg and Hudson Bay[77]. It is necessary to estimate the extent to which they should share. Clearly, some services are more relevant to one activity than to another.

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[76] Part III of the *Government of Canada Estimates* provides a reasonably detailed breakdown of these resources on a national basis, but very little regional or provincial information. It became necessary to find a way to estimate resource utilization on a regional basis. This was accomplished using statistics such as number of navigation aids as workload proxies, and pro-rating national expenditures accordingly. From the regional distribution of these statistics, national resource utilization was allocated to develop measures of regional costs.

*Navigational aids* are essential for the safe movement of goods and people in commercial operations whether it be Seaway size lakers, tugs and barges or ferries. To some extent, they are less important to smaller vessels particularly pleasure craft. In general, the lower the vessel draft, the lower the value of navigation aids as placed by the Coast Guard. Also, some navigational aids are located in and around canals and waterways such as the Rideau and Trent-Severn Systems and the Canadian lock at Sault Ste Marie which are only used by pleasure craft. (It should also be noted that the costs of maintaining these facilities are not borne by the Coast Guard, and therefore not included in this paper.) While this is so, navigational aids are placed, replaced and maintained by the Coast Guard. Then there is Lake Winnipeg and Hudson Bay. Overall, it is probably fair to estimate that about 75% of the cost of this key element could be attributed to commercial freight navigation through the Great Lakes and St Lawrence.

*Icebreaking* is provided for commercial operations and ferry services. This activity is relatively small in the Central Region, with probably some 80% attributable to commercial transport operations on the Great Lakes and St Lawrence. Icebreaking and ice management in the Laurentian Region are excluded from these estimates since they are mainly provided for winter navigation and flood control in the St. Lawrence River.

*Marine Regulatory*, which covers ship safety and emergencies could probably also be apportioned 80% to commercial operations although since the ship inspection part of this group includes the inspection of foreign vessels calling at Canadian ports, the actual amount of the allocation to Canadian carriers should be lower.

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[77] Transport Canada Marine states that, although the Central Region's operational responsibilities extend into the western part of Hudson Bay and include Lake Winnipeg, the level of expenditures in those areas is not significant.

Only a small portion of Central Region *Marine Search and Rescue* is properly allocated to commercial freight transport activity. With the large number of fishing vessels and recreational boaters, and the relative prominence of Lake Winnipeg and Hudson Bay, probably about 80% of the cost could be attributed to these latter activities.

*Public Harbours and Ports* is difficult to allocate to commercial marine freight transport operations in general. Detailed study would indicate the specific services responsible, but port specific data could not be obtained. For the purpose of the present examination, essentially an understanding of the orders of magnitude concerned, a figure of 70% was assumed.

Allocated costs, on the basis of the percentages developed above, are shown in the table that follows. It is particularly important to note that no costs borne by the United States Coast Guard, other American federal, state or municipal agencies are included, nor are other Canadian costs, particularly revenue shortfalls from ports other than the *Public Ports and Harbours* discussed above. It might be realistic to virtually double the figures below.

**Canadian Coast Guard Expenditures**
**Attributed to Great Lakes and St Lawrence**
**Commercial Freight Transport**

| | Expenditure $ 000 | Allocation % | Total $ 000 |
|---|---|---|---|
| Marine Navigation Systems | 37,200 | 75 | 27,900 |
| Icebreaking and Arctic Operations | 3,200 | 80 | 2,600 |
| Marine Regulatory | 2,200 | 80 | 1,800 |
| Marine Search and Rescue | 9,600 | 20 | 1,900 |
| Public Harbours and Ports[78] | 9,500 | 60 | 6,700 |
| **TOTAL** | **61,700** | | **40,900** |

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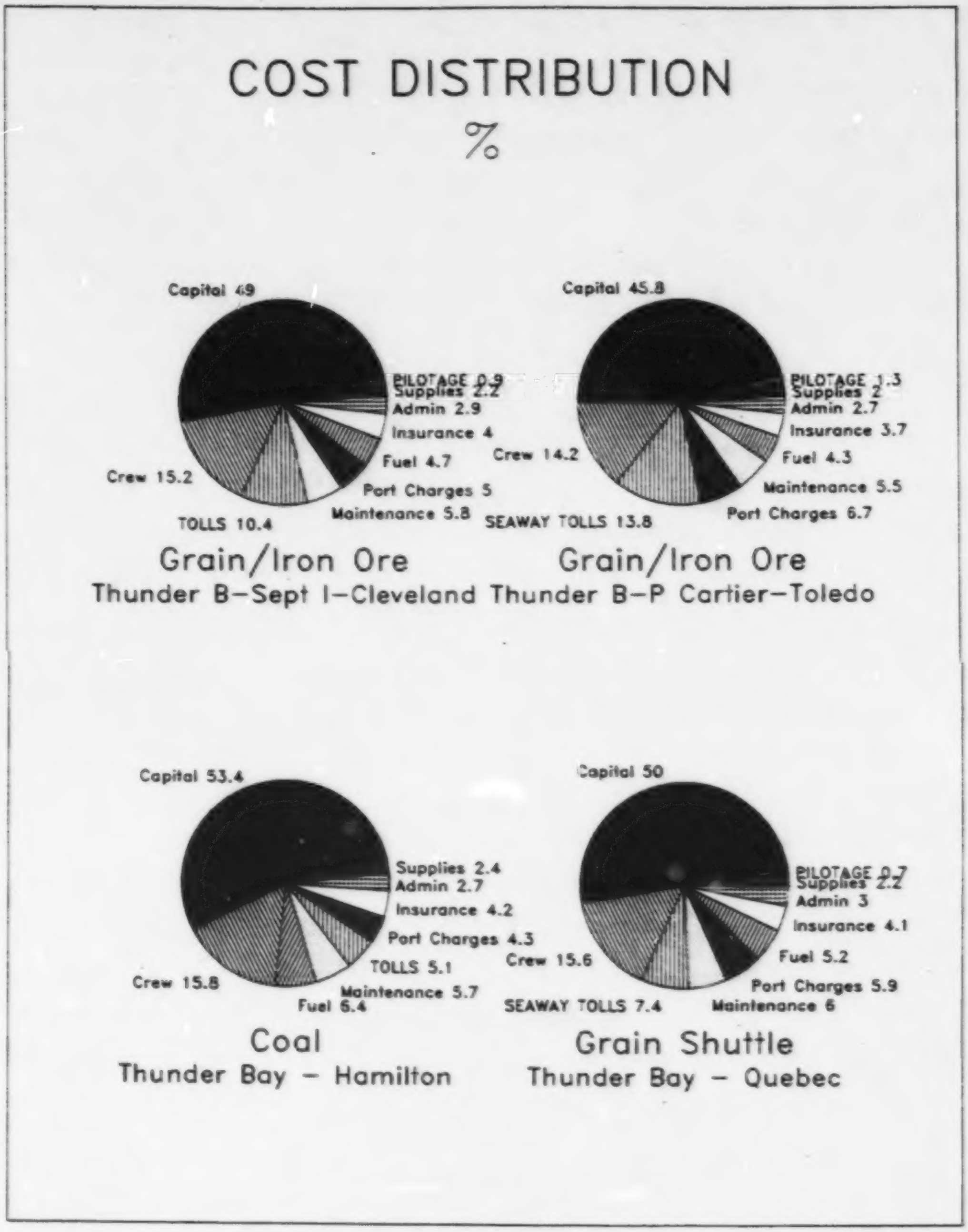
[78] Amount of expenditure shown reflects credit of 1/3 recovery that is credited in government accounts to the consolidated revenue fund.

### *Cost Recovery Implications*

> ***The present impact of infrastructure cost recovery, Seaway tolls, pilotage fees and harbour charges ranges from nil to approximately 15% of total cost. Recovery of Canadian Coast Guard costs would amount to $1/tonne of cargo moving through the Seaway. If capital related charges (vessel or infrastructure) are not considered, full recovery of all (Canada and U.S.) infrastructure costs could add up to a 50% increment to Seaway vessel operating costs.***

Having allocated the operations costs on what seems to be a rational, albeit very approximate, basis, it is relevant to view these allocations from the perspective of the potential impact of cost recovery, were it to be instituted, on the competitiveness of freight transport through the Great Lakes St Lawrence. Such an exercise can only yield approximate results, but then the measures of competitiveness used are at least as approximate. The following figure indicates the sensitivity, to Seaway tolls and pilotage fees, of vessel cost for four services selected for the range of facilities utilization involved.

It can be seen that, for the illustrated examples, Seaway tolls account for from 5.1% to 13.8% of total vessel cost. Pilotage can raise the total to over 15%. The examination of the overall competitiveness of Great Lakes St Lawrence services, relative to the rail mode, suggests that figures of these magnitudes could prove important, particularly where the cargo concerned is grain. The impact is, under current U.S. policy, a little overstated because the U.S. St Lawrence Seaway Development Corporation's share of tolls, 27% of the MLO total, is rebated to the carriers. The Corporation's costs, although only 16% of those of the Canadian Seaway overall, apply more than proportionately to charges for grain to the lower St Lawrence.



On the other hand, there are U.S. Army Corps of Engineers and U.S. Coast Guard costs, for which there is no cost recovery and which are not considered above.

Canadian Coast Guard charges of $40,900,000 annually are approximately $1/Tonne of cargo moving through the Seaway would equal 66% of SLSA costs, and would add another 6% to 7% to vessel costs were the Seaway toll structure to be the allocation basis[79]. If one increases charges still further to recover U.S. and other Canadian costs, the burden on the industry rises considerably. Infrastructure charges recovered from the industry might equal 20% of vessel operations costs.

There would be those, particularly in the rail industry, who would not find this level of infrastructure costs prohibitively high[80]. A railway with such an infrastructure cost would be well off. However, pursuit of such a simplistic path of reasoning is fraught with peril; allocation of essentially constant costs among units of production invariably is. Some of the marine infrastructure costs concerned are variable, but most are not. Railway infrastructure cost is largely variable, at least in the longer term.

## OPERATING COST IMPACT

The above numbers may superficially appear modest, thus conforming with conventional wisdom to the effect that tolls and cost recovery would have a negligible impact on carrier or system competitive viability. In other words, it is often believed that tolls and pilotage fees do not, and broader cost recovery would not, significantly impact the competitiveness of the Great Lakes/St Lawrence routing with respect to its direct rail, West Coast, Mississippi and other competitors. This may be true for some traffic; it may not be so in other cases, among them Canadian and U.S. export grain.

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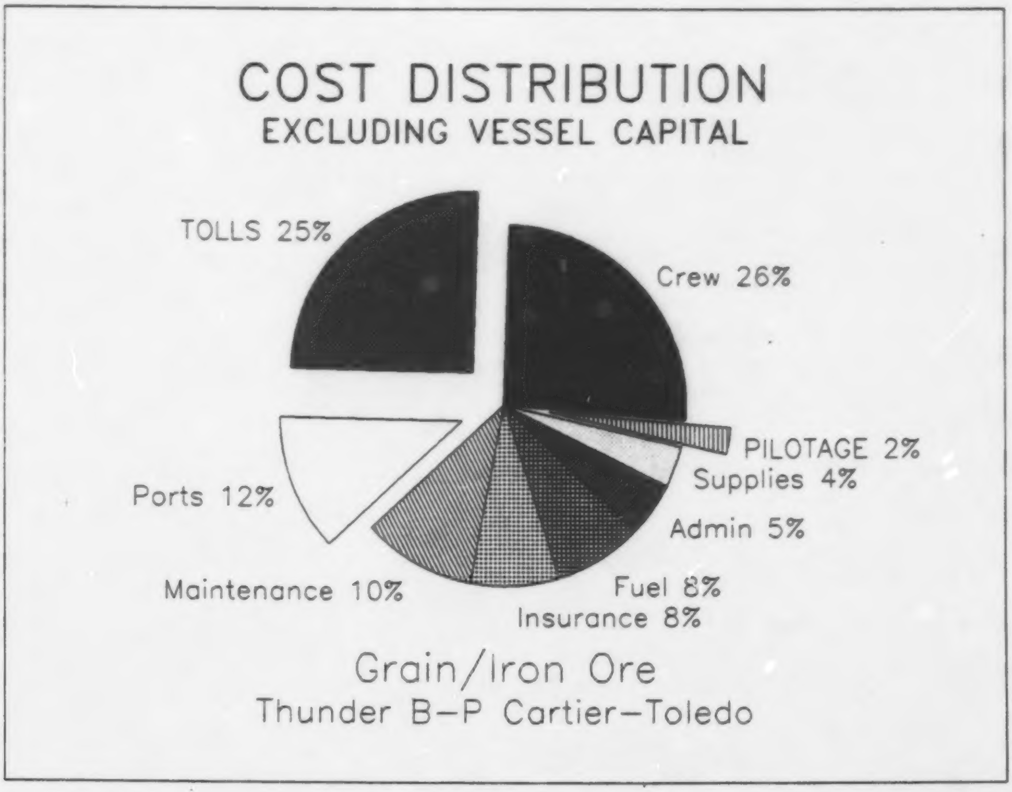
[79] There is no dominating logic to suggest that such an allocation procedure would be adopted. In reality, for the allocation of what are largely fixed costs to traffic, there is a plethora of possibilities. Proration according to a formula similar to the present Seaway tolls (but, of course, not based on use of the Seaway facilities alone) is probably the best the Canadian bulk shipping industry could hope for. A tonnage/distance formula is probably the worst.

[80] The *variable* component of line infrastructure (roadway, track, signals and communications) cost for the movement of Western grain is approximately 23% of total variable cost.

There is another perspective. The relative magnitude of infrastructure cost recovery charges gains considerable significance when it is noted that approximately 50% of the base costs shown above relate to vessel capital. In a *defensive* posture, where a system is trying to hold onto slipping volume, fixed costs, particularly those related to recovery of *sunk* investment expenditures, have no relevance. The pie chart below is the result of removing capital charges from grain/iron ore costs (the lower right hand chart above).



Seaway tolls and pilotage together are now the dominant cost component, rivalled only by crew costs. The dominance of these two components is accentuated when it is noted that the next most important *Port Charges* is frequently not considered a vessel operations cost (or included in a carrier's rates).

Also, it is relevant to consider the cumulative effect of a total schedule of such charges. From such a perspective, the following approximate figures might apply.

**Increment to Vessel Operating Costs[1]**
**Export Grain with Iron Ore Backhaul**

| | **$millions** | **%** | **Cumulative %** |
|---|---|---|---|
| St Lawrence Seaway Authority[2] | 61.5 | 21.2 | 21.2 |
| St Lawrence S. Develop. Corp. | 10.0 | 3.5 | 24.7 |
| Canadian Coast Guard[3] | 40.9 | 14.1 | 38.8 |
| Pilotage | actual fees | 1.8 | 40.6 |
| U.S. Coast Guard[4] | say 10.0 | 3.5 | 44.1 |
| U.S. Army Corps of Engineers[4] | say 10.0 | 3.5 | 47.6 |

1 including port charges[81] and fuel

2 Rather than allocating 1988-89 costs to tonnage of that year, which was (historically at least) anomalously low, proration on the basis of St Lawrence Seaway Authority tolls is used. As the SLSA did not cover its costs in this particular year, the former methodology would produce higher figures.

3 To the extent that some Canadian Great Lakes traffic does not pass through the Seaway, the allocation procedure must be expected to overstate the impact. However, for Canadian traffic, this effect is minor.

4 Dissimilar to the Canadian situation, much U.S. traffic moves within the upper Lakes. Allocation of such U.S. costs is beyond the scope of the study. These items are included for completeness and to illustrate the general point.

The above table casts a somewhat different light on the perspective of user charges as an insignificant component of cost. While it is not the only perspective, it demands a certain consideration because it is the perspective of an operation that is *down* and striving to survive.

Incidentally, it also illustrates a key perspective on the Canada/U.S. *equal treatment with respect to users charges* controversy. Canadian government expenditures attributable to movements through the system (as opposed to within the upper Lakes) are considerably higher than U.S. expenditures. The traffic is international but most of the Seaway is Canadian.

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[81] Not included here, the U.S. charges 5% of cargo value as a port charge.

## INFRASTRUCTURE CAPITAL CHARGES

One further item to consider; the above calculations do not include capital related charges for the infrastructure itself. There is a considerable capital investment cost within each major activity grouping. Also, all cannot be assumed to be sunk cost. For example, the Federal government has, over the years, forgiven Seaway capital costs. Recently, after a wall collapse, it provided the Seaway with a $175 million grant spread over seven years for repair and upgrading of the Welland. Analogously, Canadian National Railways have, over the years, had billions of dollars of debt forgiven by the Federal government. At least insofar as the Seaway is concerned, the need for *sustaining capital* investment will continue.

Without considering the impact that any move to recover capital investment related charges would have, it is inappropriate not to recognize these very real costs. One of two approaches can be taken (but not both). Either depreciation and cost of capital on the undepreciated balance of historical cost can be charged, or a market value approach can be taken. The latter approach would consider past investments at salvage value and decide charges to recover new investments before the investment decision is made. Under many circumstances the salvage value (value in the most valuable alternative use) of transportation infrastructure is low. However, two general exceptions apply; urban and waterfront property.

With urban ports, in particular, analysis is very complex and fraught with conceptual pitfalls. For example, charging the transportation use of Toronto harbour lands on the basis of their value as, say, high-rise condominium sites, would produce amusing figures. However, its commercial port function is not the only service provided. Its financial statements suggest that Toronto harbour is also a real estate or property management operation. Property revenue and asset value growth would also have to be considered.

### *Cost Recovery: Flaws, Theory and Practice*

> ***Cost recovery is commonly seen as contributing to equal treatment of modes and economic efficiency. Charging traffic for an allocation of the essentially fixed cost of infrastructure provision may, however, lead to inefficient modal choice.***

Even presuming a comprehensive set of cost data is available, efficient and equitable cost recovery requires attribution, where possible, of the costs to the various users of the System. For example, most of the capital cost of the Seaway is undoubtedly connected with commercial maritime commerce (and hydroelectric power generation), and not pleasure craft. Pleasure craft could easily have used the predecessor system of canals. On the other hand, such craft should be responsible for at least incremental operating cost attributable to them, and for any congestion related cost calculated as if they were the marginal vessel congesting the system.

The user charges issue is particularly topical at present with the Canadian Coast Guard working on a policy paper the release for discussion of which had been expected by the end of 1989. While a relatively new topic in inland marine circles, cost recovery and its economic efficiency and modal equity effects are a well established concern among railways and truckers in particular. This study does not address the latter subject, except in the context of modal equity and an efficient transportation system.

While cost recovery in the marine mode may be thought of as being relatively simple and straightforward, design of an economically efficient and equitable system of charges, that generates sufficient funds to balance expenditures, is extremely difficult if not technically impossible. While charging carriers for infrastructure costs for which they are causally responsible is sound in theory, this only applies to variable or incremental cost[82].

Dividing total costs, including the very substantial portion that is time dependent, rather than volume dependent, by total annual traffic volume, and setting user charges accordingly (which is what was done to calculate the cost recovery charges of the previous section), can have the reverse effect from that economically desired. During periods of depressed activity, charges are high, further discouraging use of an already under-utilized facility, and hitting users hard when they are weakest. On the other hand, during booms or peaks, charges are relatively low, encouraging greater use when capacity is already stressed.

The Seaway and the various ports have well established policies for recovering costs as do the Pilotage Authorities. That does not mean that users are satisfied with the manner in which these costs are recovered. Marine carriers, for example are in competition with surface transportation, particularly the railways, for much of the North American traffic they handle and the level of cost recovery in that mode can have an impact on the respective competitive positions of these modes. In addition, Great Lakes carriers compete to some extent with the Mississippi River system and outlets serviced by the railways on both coasts in Canada and on three coasts in the United States.

The value of a thorough study of these options to Ontario will only be apparent when the Federal cost recovery decision process and the role the Province might play are apparent. A comprehensive analysis of the impact of cost recovery is well beyond the scope of this project, and the Ministry of Transportation and the Province generally would wish to approach the topic from a more general perspective than the marine mode.

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[82] Strictly speaking, for economic efficiency, each element of traffic should be required to cover the decremental cost attributable to it.

Study of this problem will probably carry a high priority, but not quite yet. However, two pertinent points, perhaps the most important conceptually, can be noted:

(1) Where no tolls are charged, as for the Mississippi[83], less than incremental cost is recovered and, hence, the competitive balance with respect to the Great Lakes/St Lawrence is tilted in favour of the Mississippi.

(2) Railway assertions, concerning full internal recovery of the costs of railway infrastructure, are noted. While, on the average and in terms of carrier profitability, the point that the railways cover their fixed infrastructure costs is true, the implication that cost recovery tolls and fees would achieve rail/GLSL modal competitive balance is unlikely to prove true.

Railway pricing, as with pricing by marine carriers with respect to cost elements under their control, is based on the competitive market subject to a variable or incremental cost constraint. System fixed costs are covered by those elements of traffic where the market will so allow. Competitively marginal traffic contributes little or nothing towards fixed costs. Charging such traffic that moves by water tolls for the recovery of infrastructure fixed operating costs would inappropriately tilt the balance towards rail.

Although there is some price discrimination within the St Lawrence Seaway Authority toll structure, tolls, pilotage fees and the tentative cost recovery charges computed in the preceding section charge highly profitable and marginal traffics at the same rate.

With the high fixed cost characteristic of infrastructure generally and the Great Lakes/St Lawrence system in particular, a conclusion is clear. Even at present levels where costs are not fully recovered, the toll and fee structure of the St Lawrence places marine carriers at a *competitive disadvantage* with respect to the marginal traffic for which they must compete with rail. Marginal tolls for marginal traffic would seem more economically efficient.

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[83] As described in Chapter 2, there is a small tax on inland waterways fuel but it is of little competitive consequence.

It is apparent that, presuming the government wishes to recover more than the volume dependent incremental cost of vessel transits, a market oriented infrastructure pricing system seems the only way to maintain an economically efficient national transportation system while recovering system fixed costs. The practical difficulties facing the designers and administrators of such a system would be legion, at least initially. Nonetheless, it is submitted that this should be considered the ideal *bench mark*, and that less perfect candidate cost recovery systems be evaluated against it.

### *Ports*

> ***Ports are locally focused organizations; many are locally financed and involved in waterfront business beyond the handling of cargo. Individual ports may be dependent on traffic that might seem of little significance to the system as a whole. The diversity of federal port organizations and environmental and development pressures for rationalization suggest that port policy will be an intermediate term issue.***

There are three major groupings of commercial ports in Canada and all fall directly or indirectly in the portfolio of the Minister of Transport. The first, Canada Ports Corporation (CPC),[84] is a grouping of fourteen ports, some of which are semi-autonomous (Local Port Corporations) and others directly managed by CPC Headquarters. These ports account for almost 50% of port tonnage handled in Canada and over 95% of container tonnage. The only CPC ports in Ontario are Prescott and Port Colborne, both of which are grain based. The second group, Harbour Commission ports[85], accounts for most of the major ports in Ontario. These ports, except for Toronto and Hamilton which have their own Acts, are established pursuant to the *Harbour Commissions Act*. The third grouping (over 50 ports in Ontario) are Public Harbours and Ports which are administered by the Harbours and Ports group in the Canadian Coast Guard. There are also a number of private commercial ports and fishing ports (administered by the Department of Fisheries and Oceans).

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[84] The CPC is largely self-financing although it has outstanding indebtedness to the Government of Canada. CPC ports pay grants in lieu of taxes to host municipalities. Local Port Corporations received, by transfer, the responsibility for all assets, liabilities and indebtedness at the time of establishment. CPC is required to repay loans from the Federal Government and to pay a dividend on its earnings. It is exempted from the requirement to pay income tax.

Port policy is, therefore, complicated by the number of ports, participants and other interested parties such as environmentalists. During the last fifteen years Federal port policy has changed considerably from the attempt in 1976 to create a single (federal) system of port management.[86] The system was to include 20 local port commissions, 300 public harbours and 500 government wharves. By 1981, policy had shifted to replacing the National Harbours Board with the Canada Ports Corporation.[87] The *Harbour Commission Act* would be changed to permit the transfer of any other port to this status.[88] Responsibility for repairs and construction at Public Harbours and Ports would be transferred from the Department of Public Works to Transport Canada. Regional Advisory Councils[89] would be established to provide advice on broad regional port development issues. Provincial governments would have direct representation on these councils.

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[85] In Ontario, Oshawa, Toronto, Hamilton, Windsor and Thunder Bay are *Commission* ports.

[86] See Transport Canada Ports Policy Bulletin No 1 December 20, 1976.

[87] The Canada Ports Corporation Act permits the more financially viable ports to be given *Local Port Corporation* status with each port having its own Board of Directors. There are currently seven LPC's; Saint John's, Halifax, Saint John, Quebec, Montreal, Vancouver and Prince Rupert.

[88] The *Public Harbours and Ports Facilities Act* permits the transfer, by Order in Council, of a public harbour to Harbour Commission status. New Harbour Commission ports would only be created when a port is deemed to be financially self-sufficient. All present Commission ports are self-sufficient with no debt although the Federal Government has, in the past, covered the debts of some ports. Current policy encourages Commission ports to use private sources such as banks to satisfy financing needs. Another source of funds would be general government programs (such as DRIE) available to other organizations. Minimum entry level threshold for Commission status would be revenues of $1 million per year. Goderich is the only port in Ontario that might currently be considered as an additional Commission port.

[89] Enacted as Section 3.12 of the Canada Ports Corporation Act in 1983. Persons contacted were unaware of the establishment of any Regional Advisory Councils.

It is now some seven years since the legislation was enacted to decentralize port management. Regardless of any concern expressed with Canada's fragmented port management structure, any move to increased centralization would be resisted strongly by Commission Ports and Local Port Corporations, the largest and most financially viable ports.

In addition to direct management and operation of ports, two other issues are becoming increasingly important when considering port policy. Of broad national significance is the increasing public concern with the environmental effects of marine operations, particularly from tanker traffic. This would be of most concern in restricted waters and port areas where the possibility of mishaps is heightened. Marine based petroleum and chemical traffic accounts for some of the major traffic flows on the Great Lakes and is, therefore, important to Ontario.

The second issue is the growing pressure placed on ports by residential and recreational development adjacent to and encroaching on commercial ports. In some instances, such as Georgian Bay, commercial ports are in decline and the growth of recreational boating and shorefront developments may be of more benefit to the local community than is the commercial marine activity. With the decline, these developments can now be facilitated with minimal disruption. In other areas, Toronto being the best example, changing land use, even on port owned property, is expected to place pressure on port activities to relocate or cease. With the large number of ports in Ontario and the growing pressure for other more "attractive" uses, a reduction in the number of commercial ports appears inevitable.

A review of port financial statements reveals few direct cost data. Harbour *Commissions* ports provide detailed reports to Transport Canada each year but the information is considered to be confidential by both the ports and Transport Canada. Although only sparse information is available, it does provide some insight into the relationship between port volumes and revenues. A correlation between costs and revenues can be anticipated.

Canada Ports Corporation includes several port activity related ratios in its Annual Report. For example, the 1988 Annual Report shows that CPC ports earned $0.92 for each tonne of cargo handled. This compares with $0.35 for Windsor, $0.61 for Hamilton and $7.48 for Toronto. Windsor's low ratio could probably be attributed to the minimal amount of general cargo (relative to bulk) handled there.[90] Hamilton, with a broader mix of traffic than Windsor, although reliant on bulk materials delivered to the steel mills, was much closer to the Ports Canada average. Toronto, on the other hand, reflected the fact that this "port" is becoming a realty company, earning most of its revenue, and probably income, from leasing its extensive property holdings. Toronto handles more general cargo than Windsor, mostly steel imported from Europe. Port revenues would certainly benefit from this traffic although the balance with costs is unknown.

With respect to port services provided directly by Transport Canada, the Department's Marine Administration provided 1989-90 budget information indicating planned expenditures of $9.5 million on dredging and port maintenance in the region.

### *Administration*

> ***Where tolls and other cost recovery fees are to be implemented or changed, uncertainty can increase investment risk in the industry. In lieu of formula based toll schedules, more market based revenue generation schemes should be studied. Efficient fixed cost recovery should not create disadvantage to Great Lakes/St Lawrence transportation relative to its route and modal competitors. The particular danger is the loss of Canadian and U.S. export grain traffic.***

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[90] International seaborne general cargo amounted to about 36,000 tonnes out of the total of over 1.5 million tonnes in 1987 according to Statistics Canada data.

***If full or greater cost recovery is to be implemented, the management structure for the provision of St Lawrence/Great Lakes infrastructure services warrants review. A unified management would allow a more commercial orientation and more effective user participation.***

## STABILITY

Long term investments are made on the basis of historical, present and projected circumstances as the business community understands them. Policy uncertainty breeds caution in the business community and can lead to deferred decisions and a *wait and see* attitude. Quite apart from the broader and longer term perspective of the merits of recovering the costs of government provided infrastructure, there are concerns whenever the rules of a *game* are suddenly changed.

Increases in user charges that significantly exceed longer term expectations would tend to have a generally destabilizing effect. To some extent, higher charges would presumably be absorbed by the carriers; the rest would be recovered from their customers. With an oligopoly, and low carrier profits, increased rates would certainly be expected. Definitive conclusions concerning the adverse effect on the Canadian marine industry's ability to withstand competition from other modes, and on the ability of dependent shippers to market their products, are beyond the precision of the present study. However, two considerations are noted:

> Export grain traffic, regardless of the institutional/political nature of the grain marketing and transportation decision making, is vulnerable to the east-west decision in the short term and probably to competition from direct rail in the intermediate term.
>
> While there is little modal competition for the iron ore and coal traffic on which the steel industry depends, there are indications that (see Chapter 1) the industry and its southern Ontario location are susceptible to market competition.

At present, the shipping industry faces the rumour of, perhaps modest but perhaps substantial, new user charges. Uncertainty is damaging. It affects an industry's (investment) risk taking posture. The Canadian Great Lakes shipping industry has been concentrating could, in the future, become a one or two carrier industry, particularly if a high investment risk continues to be perceived.

Most arguments for full cost recovery of government provided services rest on arguments of economic efficiency and economic equity. However, changes to the level of infrastructure subsidy, which has been consciously developed over a period of years, may be neither efficient nor equitable. Industrial dislocation, and the inevitable social disruption that follows, can have economic (and political) impacts. There comes a point, particularly in fiscally difficult times, where governments must withdraw from the provision of subsidized services. This is much more damaging than to decline to subsidize in the first place.

There is an almost unseemly quality about government policy that builds facilities, fosters the development of an industry, and then once the industry has developed, imposes charges that could lead to its demise. One of the major factors of production is risk, and any change in the present balance between modes and routes changes risk; user charges or at least changes in user charges would increase risk.

## RECOVERY MECHANISM

Having derived a commercial marine allocation for government provided infrastructure costs (above), the question arises as to how these costs could be recovered. The Great Lakes/St Lawrence System is used by commercial carriers registered in Canada, the United States and many countries around the world. Charges based on the St Lawrence Seaway Authority toll schedule, as used in the illustrative example above, represent only one of a plethora of options. One should first decide what the infrastructure subsidy is intended to support? Is it the carriers, transportation generally or domestic commerce? Is it exports? Imports?

Although the questions above have doubtless been addressed on a policy level within the federal government, no public document doing so is known. Some of these questions have obvious answers. It would not make sense to deliberately subsidize foreign shipping at the expense of the domestic industry; this applies both within the marine mode and among modes. Also, it would not make sense to subsidize imports at the expense of competing domestic Canadian production. In the specific context, subsidized foreign shipping within the Great Lakes/St Lawrence is not justifiable.[91]

The subsidy of transportation generally, and domestic commerce in particular, is not a question with such categorical answers. There are some general principles; for example, to be efficient, transportation subsidies should be modally neutral. In essence, transportation subsidies are intended to encourage or protect (improve the economics of) production remote from sites of consumption. In the Canadian domestic context, where the demand for most products is concentrated with the population and wealth in a belt, less than 100 km wide, from Quebec City to Windsor, transportation subsidies mitigate the natural tendency for production, wealth and population to concentrate. From Ontario's perspective, encouragement of economic activity outside of Southern Ontario encompasses both production outside of Ontario and the encouragement of development of the more remote regions of this very large province. The Province also has a direct interest in the efficiency of candidate subsidy mechanisms.

The question of cost recovery mechanism, and subsidy and its merits is even more complicated when considerations of international trade are introduced. It is conventional wisdom (frequently but not always true) that exports enhancement is in the best interest of an exporting nation or region. The reverse is presumed to apply to imports. Importantly, in the context of the Great Lakes and St Lawrence with its domestic carriers, the above is at least as true with respect to services as it is for products. A key question is how can a cost recovery/underrecovery system be tuned to focus any subsidy on the target sector.

---

[91] The argument that subsidizing shipping essentially subsidizes Canadian commerce in the international market neglects the fact that a more *specific* subsidy, targeted at export industries, would inevitably be more efficient.

If a simple schedule of tolls is the cost recovery mechanism, it would not be acceptable to charge different tolls to carriers from offshore, but there are mechanisms for achieving similar ends, if such are desired. More significant, what may be charged without discouraging ocean carriers from continuing to pick up and deliver cargoes in the System? Would the goods continue to move? How would user charges affect the movement of Canadian and U.S. grain through the System? Would ocean carriers call, for example, at Atlantic Coast and Gulf of Mexico ports, thereby avoiding these charges and diverting cargo away from the System to other ports and areas where such costs are hidden? Most important, from a policy viewpoint, is the degree to which such shifts might enhance or detract from economically efficient trade.

The Great Lakes/St. Lawrence System competes with other modes, particularly the railways, and with other systems such as the Mississippi and ports located on three coasts. With respect to the principle of *equal treatment of modes*, railways must recover all operating and capital costs associated with rail transportation[92]. Thus, cost recovery infrastructure charges would, at least superficially[93], keep the *playing field* level with respect to rail. However, the United States has always treated inland waterways and inter-coastal waterways as part of the infrastructure required for national defense, with the Army Corps of Engineers building, maintaining and operating the canals and other facilities at little cost to the user. Were additional costs added to System participants to further divert Canadian traffic onto that more highly subsidized waterway, neither the national interest nor the common Canada/U.S. interest would be served.

---

[92] It may be argued that railways do not have to recover all of their costs from shippers; witness payments under the *Western Grain Transportation Act* and the slowly dying *At and East* rates on grain and flour. These latter rates have, in all likelihood, provided work for the railways at the expense of the Great Lakes carriers.

[93] Railway and Great Lakes competitive pricing considerations that would bring this into question have been discussed earlier in this report.

## PRICING STRUCTURE AND INSTITUTIONAL FRAMEWORK

The institutional management structure adopted essentially circumscribes the range of pricing options available to achieve or improve cost recovery. Essentially, the closer an institution is to the political process the more necessary it is that equal and equitable treatment can be demonstrated. Close to government, economic efficiency may still appear in the objective function, but *appearance* and *proof* of equity are binding constraints. With reporting lines leading directly to a minister Departments are restricted to a highly mechanistic formula approach since the minister must be able to demonstrate the equity of *his* decisions[94] before a singularly hostile and powerful audience. Agencies, on the other hand, being at *arms length,* can make clear decisions based on the mandate provided in the establishing legislation.[95] Commercial freedom can only be effectively exercised at *arms length* from government.

Possibilities for mechanistic cost recovery formulae include charges based on gross registered tonnage of the vessel, number of lock transits, lockage time, etc. Another possibility relates to mileage travelled in the System. Intermediate mechanisms include tariffs of tolls based generally on the value of the cargo concerned, with incentive rates for crucial exports etc. Such a mechanism would lend itself to an Agency structure at reasonable distance from the minister concerned. Responding to the inevitable rate lobbying would be *no-win* for a minister.

It is the possibility of a system including a degree of market based pricing that offers the most interesting possibilities for the competitiveness of the System relative to its system and modal competitors, particularly rail and the Mississippi. If any such possibilities develop, the issue of equity of treatment promises considerable interesting debate. The obvious *Mississippi competitive* rates (for example, lower tolls for U.S. than Canadian grain) would stimulate some strong feelings. For marginal traffic, System management could offer rates that produced little more than the incremental cost of handling that traffic.

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[94] or that any inequity is the result of required adherence to a law beyond his immediate control.

[95] Agency decisions can generally be appealed to one or more of the Minister, the *Governor in Council* or the Courts.

## MANAGEMENT STRUCTURE

A Great Lakes/St Lawrence infrastructure management structure with commercial freedom would offer another dimension of flexibility. If all traffic must pay according to the same fixed tariff of tolls, it is only reasonable that all paying the same receive the same service. Inevitably, given the range of commercial operations and circumstances on the Lakes, some carriers must pay for, and therefore might as well take, service quality they would rather not pay for; others would be willing to pay for service quality that is not provided. Carriers experiencing difficulty delivering quantities and to the schedules that their customers desire would doubtless be willing to pay[96] for priority treatment of their vessels.

There is a common slogan, *User Pay - User Say*. As is so frequent with slogans, it can mean quite different things to different groups espousing it. Substantially, what is feasible with respect to *User Pay - User Say* depends on the nature of the organization delivering the service. If a service is provided directly by a Department of government, and does not fall under a regulatory purview, it is not possible for any real decision making power to rest with anyone other than the minister concerned. Advisory committees of users is the maximum realistic limit for *user say*. For some, this is satisfactory participation.

With agencies more or less at *arms length* from the government concerned, day to day management can be directed by appointed Board members, commissioners, etc. Such may be selected according to their backgrounds so that an understanding of the various interests may be achieved. It is not, however, realistic to expect that these persons would *represent* the interests concerned within the decision making apparatus of the agency. Primary responsibility is to the government for operation according to the legislation under which the agency is constituted.

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[96] Carrier and Seaway representatives at the Guild Inn *round table* saw commercial pricing of Seaway services --essentially any incentive pricing scheme-- as an unnecessary complication to their commercial relations. Although most if not all other consensus opinions of the *round table* were accepted as guidance to the conclusions of this final report, this was not. Instead, it is noted that other industry opinions included interest in exploring the concept further.

Greater separation from government as a Crown Corporation, or even as a venture in which the government opts for partnership with other entities, including users, offers more scope. At the extreme, full privatization is (conceptually at least) possible. With such forms, user participation in decision making is possible from dual perspectives. Equity interest or effective management participation is realistic, and/or influence can be exerted through commercial negotiation. With respect to the latter case, the exertion of influence can either be through collective bargaining by user groups and/or through individual commercial negotiation.

The above concepts apply to the provision of Great Lakes/St Lawrence infrastructure services generally. Considering aspects of practicality, it is necessary to note the institutions currently involved and the relationship of the Great Lakes/St Lawrence services delivery mechanism to the broader provision of transportation infrastructure (particularly marine) services. The St Lawrence Seaway Authority is unique to the system and has *agency* status, but can not be considered substantially removed from the federal government. The pilotage authorities have analogous status. Geographical areas of responsibility of current organizations are not identical but there is no obvious reason why Seaway and pilotage services could not be provided by or through a single organization.[97]

Provision of services in support of shipping within the Great Lakes/St Lawrence is only one function of the Coast Guard. This element of Transport Canada provides marine infrastructure services throughout the nation and off its coasts. A system of cost recovery for many of these services is an objective of the current federal government, but a favoured mechanism is not obvious. Certain Coast Guard services are specific to the Great lakes/St Lawrence but geographical decentralization of most would not be logical. Ice breakers, for example, operate in the Lakes at certain times and in the Gulf and Arctic for much of the rest of the year.

No obvious management structure for the long term future of the Great Lakes/St Lawrence System is apparent. Nor are there conspicuous concerns with the current structure. Changing circumstances, particularly with respect to cost recovery, may lead to an opening of this substantial topic. It is important that the rigidity of governmental organization with respect to revenue generation does not operate to the detriment of an efficient Great Lakes and St Lawrence and national transportation system.

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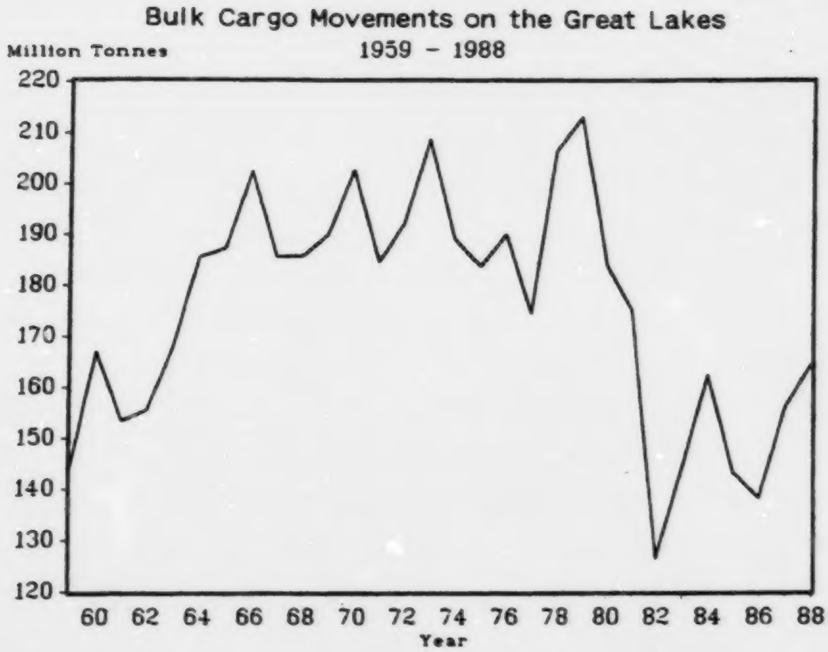
[97] As noted earlier, the Great Lakes Pilotage Authority is a subsidiary of the St. Lawrence Seaway Authority.

# APPENDIX A

## Commerce Through The Great Lakes/St. Lawrence

| TITLE | PAGE |
|---|---|
| Bulk Cargo Movements on the Great Lakes 1959 - 1988 | 194 |
| Cargo Movements on the St. Lawrence Seaway 1959 - 1988 | 196 |
| Grain Traffic Through the Seaway 1959 - 1988 | 198 |
| World Grain Production & Consumption 1960 - 1988 | 200 |
| Canadian Grain Traffic Through The Seaway 1959 - 1988 | 202 |
| Canadian Grain Exports By Outlet 1974 - 1987 | 204 |
| Seaway Share of Canadian Exports by Outlet 1974 - 1988 | 207 |
| Market Share of Canadian Grain Exported Via Seaway 1974 - 1987 | 208 |
| U.S. Grain Traffic Through the Seaway 1959 - 1988 | 210 |
| World Grain Trade & U.S. Grain Exports 1960 - 1988 | 212 |
| Share of U.S. Outlets of U.S. Grain Exports 1976 - 1988 | 214 |
| Percent of U.S. Grain Exports Via Seaway & Atlantic 1967 - 1988 | 216 |
| Monthly U.S. Grain Exports Through the Seaway & Atlantic Outlets 1986-1987 | 218 |
| U.S. Grain Exports through the Seaway by Market 1976 - 1987 | 220 |
| Share of Export Markets of U.S. Grain 1976 - 1987 | 222 |
| Market Share of U.S. Grain Exported Via Seaway 1976 - 1987 | 224 |
| Iron Ore Traffic Through the Seaway 1959 - 1988 | 226 |
| Iron Ore Upbound Traffic Through the MLO to the U.S. & Canada 1959 - 1988 | 228 |
| Iron Ore Upbound Traffic Through the Welland to the U.S. & Canada 1959 - 1988 | 230 |
| Share of U.S. Iron Ore Receipts by Route 1978 - 1987 | 232 |
| Coal Traffic Through the Seaway 1959 - 1988 | 234 |
| Other Bulk Traffic Through the Seaway 1959 - 1988 | 236 |
| General Cargo Traffic Through the Seaway 1959 - 1988 | 238 |
| Percent of U.S. Steel Imports by Route 1978 - 1988 | 240 |



Bulk Cargo Movements on the Great Lakes
1959 - 1988

Source: Based on Lake Carriers' Association data

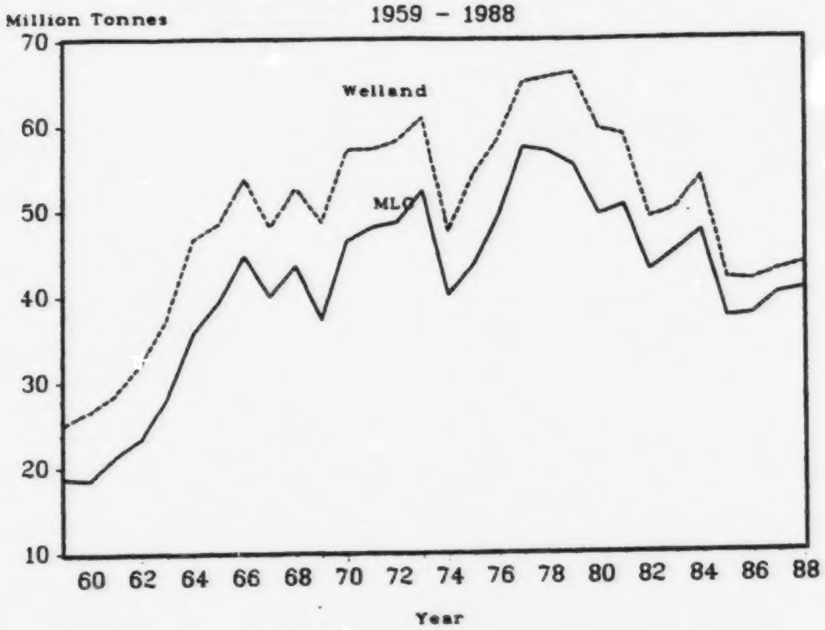
## Bulk Cargo Movements on the Great Lakes
1959 - 1988

Millions of Metric Tonnes

| Year | Iron Ore | Coal | Stone | Grain | Petroleum Products | Cement | Potash | Total |
|---|---|---|---|---|---|---|---|---|
| 1959 | 52.26 | 42.83 | 23.72 | 12.34 | 13.07 | 0.00 | 0.00 | 144.22 |
| 1960 | 74.22 | 42.35 | 24.65 | 12.82 | 12.96 | 0.00 | 0.00 | 167.00 |
| 1961 | 61.85 | 39.87 | 23.05 | 15.06 | 13.49 | 0.00 | 0.00 | 153.33 |
| 1962 | 64.07 | 41.88 | 22.43 | 14.44 | 12.60 | 0.00 | 0.00 | 155.42 |
| 1963 | 68.35 | 46.83 | 25.89 | 17.03 | 9.78 | 0.00 | 0.00 | 167.89 |
| 1964 | 79.34 | 47.29 | 27.91 | 19.62 | 11.27 | 0.00 | 0.00 | 185.42 |
| 1965 | 79.86 | 49.49 | 27.95 | 19.84 | 10.13 | 0.00 | 0.00 | 187.27 |
| 1966 | 86.61 | 50.41 | 30.85 | 22.68 | 11.77 | 0.00 | 0.00 | 202.33 |
| 1967 | 81.87 | 47.96 | 28.76 | 15.98 | 10.98 | 0.00 | 0.00 | 185.55 |
| 1968 | 84.94 | 44.31 | 30.01 | 14.80 | 11.64 | 0.00 | 0.00 | 185.71 |
| 1969 | 87.66 | 42.55 | 32.72 | 15.05 | 11.92 | 0.00 | 0.00 | 189.91 |
| 1970 | 88.38 | 45.06 | 34.89 | 21.60 | 12.58 | 0.00 | 0.00 | 202.51 |
| 1971 | 79.39 | 39.30 | 30.83 | 22.89 | 12.11 | 0.00 | 0.00 | 184.52 |
| 1972 | 82.43 | 39.24 | 33.87 | 24.21 | 12.49 | 0.00 | 0.00 | 192.23 |
| 1973 | 96.03 | 35.92 | 38.89 | 24.07 | 13.68 | 0.00 | 0.00 | 208.58 |
| 1974 | 88.95 | 31.73 | 39.08 | 17.76 | 11.51 | 0.00 | 0.00 | 189.04 |
| 1975 | 81.22 | 35.54 | 34.17 | 22.23 | 10.47 | 0.00 | 0.00 | 183.63 |
| 1976 | 87.98 | 34.00 | 34.65 | 21.30 | 12.01 | 0.00 | 0.00 | 189.93 |
| 1977 | 68.10 | 35.35 | 33.75 | 23.57 | 13.66 | 0.00 | 0.06 | 174.44 |
| 1978 | 90.28 | 34.25 | 36.05 | 29.10 | 16.52 | 0.00 | 0.21 | 206.41 |
| 1979 | 93.50 | 41.56 | 33.53 | 26.19 | 17.76 | 0.00 | 0.43 | 212.98 |
| 1980 | 74.11 | 37.46 | 25.40 | 28.57 | 17.26 | 0.00 | 0.81 | 183.61 |
| 1981 | 76.08 | 35.45 | 22.30 | 25.61 | 14.21 | 0.00 | 1.45 | 175.09 |
| 1982 | 39.12 | 33.34 | 13.67 | 25.65 | 13.01 | 0.00 | 1.64 | 126.43 |
| 1983 | 52.90 | 33.17 | 16.70 | 26.16 | 13.57 | 0.00 | 1.45 | 143.96 |
| 1984 | 58.16 | 39.12 | 21.00 | 25.53 | 13.57 | 3.09 | 1.84 | 162.31 |
| 1985 | 52.99 | 32.95 | 22.66 | 18.19 | 11.68 | 3.08 | 1.68 | 143.24 |
| 1986 | 46.27 | 32.89 | 24.69 | 18.28 | 10.87 | 3.70 | 1.48 | 138.17 |
| 1987 | 55.96 | 34.22 | 30.07 | 20.26 | 10.45 | 3.45 | 1.54 | 155.95 |
| 1988 | 61.94 | 36.75 | 32.19 | 17.32 | 10.86 | 3.78 | 1.53 | 164.37 |

Cargo Movements on the St. Lawrence Seaway

1959 - 1988

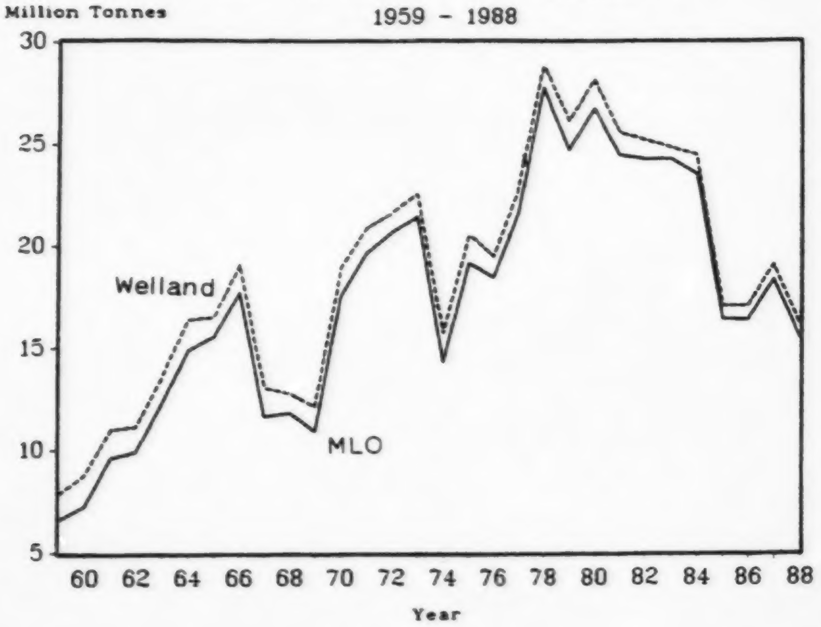


## Cargo Movements on the St. Lawrence Seaway
## 1959 - 1988

| Year | Montreal - Lake Ontario | Welland Canal |
|---|---|---|
| | Millions of Metric Tonnes | |
| 1959 | 18.68200 | 24.98100 |
| 1960 | 18.42500 | 26.53500 |
| 1961 | 21.24400 | 28.53500 |
| 1962 | 23.21800 | 32.12000 |
| 1963 | 28.07100 | 37.47000 |
| 1964 | 35.66100 | 46.61900 |
| 1965 | 39.35600 | 48.46200 |
| 1966 | 44.67800 | 53.77100 |
| 1967 | 39.94200 | 47.90800 |
| 1968 | 43.50300 | 52.68400 |
| 1969 | 37.20700 | 48.56400 |
| 1970 | 46.42100 | 57.11900 |
| 1971 | 48.06900 | 57.20500 |
| 1972 | 48.67600 | 58.23500 |
| 1973 | 52.28500 | 60.95800 |
| 1974 | 40.04900 | 47.50000 |
| 1975 | 43.55400 | 54.29400 |
| 1976 | 49.34800 | 58.36800 |
| 1977 | 57.45600 | 65.07700 |
| 1978 | 56.94300 | 65.67100 |
| 1979 | 55.32200 | 66.16500 |
| 1980 | 49.45400 | 59.60600 |
| 1981 | 50.56900 | 58.85100 |
| 1982 | 42.81500 | 49.02400 |
| 1983 | 45.06100 | 50.14500 |
| 1984 | 47.50500 | 53.91700 |
| 1985 | 37.32200 | 41.85200 |
| 1986 | 37.58200 | 41.61300 |
| 1987 | 39.96900 | 42.72500 |
| 1988 | 40.55800 | 43.53600 |

GRAIN TRAFFIC THROUGH THE SEAWAY

1959 - 1988

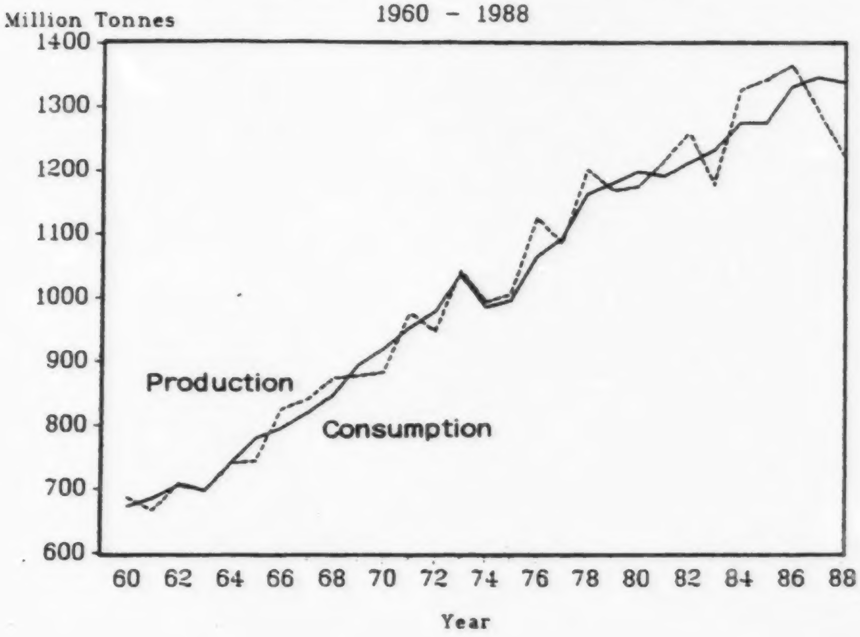


## Grain Traffic Through the Seaway
## 1959 - 1988

| Year | Montreal - Lake Ontario | Welland Canal |
|---|---|---|
| 1959 | 6.573000 | 7.842000 |
| 1960 | 7.259000 | 8.773000 |
| 1961 | 9.579001 | 11.01000 |
| 1962 | 9.895001 | 11.14200 |
| 1963 | 12.25700 | 13.59100 |
| 1964 | 14.85700 | 16.37900 |
| 1965 | 15.53000 | 16.50200 |
| 1966 | 17.70500 | 19.07800 |
| 1967 | 11.63400 | 13.02900 |
| 1968 | 11.80500 | 12.77100 |
| 1969 | 10.92600 | 12.12700 |
| 1970 | 17.53900 | 18.89300 |
| 1971 | 19.63500 | 20.88400 |
| 1972 | 20.67500 | 21.63200 |
| 1973 | 21.43500 | 22.59200 |
| 1974 | 14.31600 | 15.70800 |
| 1975 | 19.16900 | 20.57700 |
| 1976 | 18.47100 | 19.45800 |
| 1977 | 21.60800 | 22.80800 |
| 1978 | 27.73600 | 28.91600 |
| 1979 | 24.71700 | 26.12600 |
| 1980 | 26.74800 | 28.14500 |
| 1981 | 24.45300 | 25.55700 |
| 1982 | 24.24700 | 25.18000 |
| 1983 | 24.26300 | 24.80400 |
| 1984 | 23.50100 | 24.44100 |
| 1985 | 16.37500 | 17.02500 |
| 1986 | 16.35400 | 17.01500 |
| 1987 | 18.32400 | 19.07200 |
| 1988 | 15.46900 | 16.06300 |

WORLD GRAIN PRODUCTION & CONSUMPTION

1960 - 1988

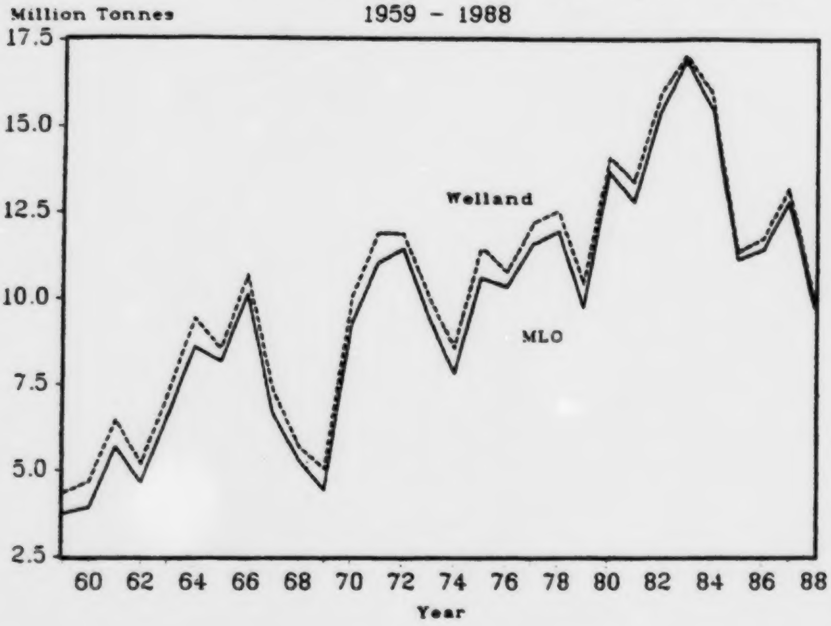


## World Grain Production and Consumption
## 1960 - 1988

| Year | Consumption | Production |
|---|---|---|
| | Million Tonnes | |
| 1959 | NA | NA |
| 1960 | 672.0000 | 686.3000 |
| 1961 | 684.5000 | 665.3000 |
| 1962 | 704.6000 | 708.5000 |
| 1963 | 696.5000 | 695.6000 |
| 1964 | 740.0000 | 739.9000 |
| 1965 | 779.4000 | 743.8000 |
| 1966 | 794.5000 | 824.4000 |
| 1967 | 818.7000 | 839.9000 |
| 1968 | 846.4000 | 873.4000 |
| 1969 | 894.4000 | 876.8000 |
| 1970 | 920.0000 | 882.6000 |
| 1971 | 952.5000 | 977.1000 |
| 1972 | 978.0000 | 945.7000 |
| 1973 | 1035.700 | 1042.600 |
| 1974 | 984.3000 | 992.8001 |
| 1975 | 995.8000 | 1005.400 |
| 1976 | 1065.000 | 1125.800 |
| 1977 | 1092.800 | 1084.900 |
| 1978 | 1163.200 | 1202.300 |
| 1979 | 1180.400 | 1169.300 |
| 1980 | 1198.900 | 1175.300 |
| 1981 | 1191.400 | 1216.200 |
| 1982 | 1213.500 | 1261.600 |
| 1983 | 1233.300 | 1177.400 |
| 1984 | 1275.600 | 1327.700 |
| 1985 | 1275.800 | 1344.000 |
| 1986 | 1332.300 | 1366.200 |
| 1987 | 1347.000 | 1296.300 |
| 1988 | 1339.100 | 1224.100 |

CANADIAN GRAIN TRAFFIC THROUGH THE SEAWAY

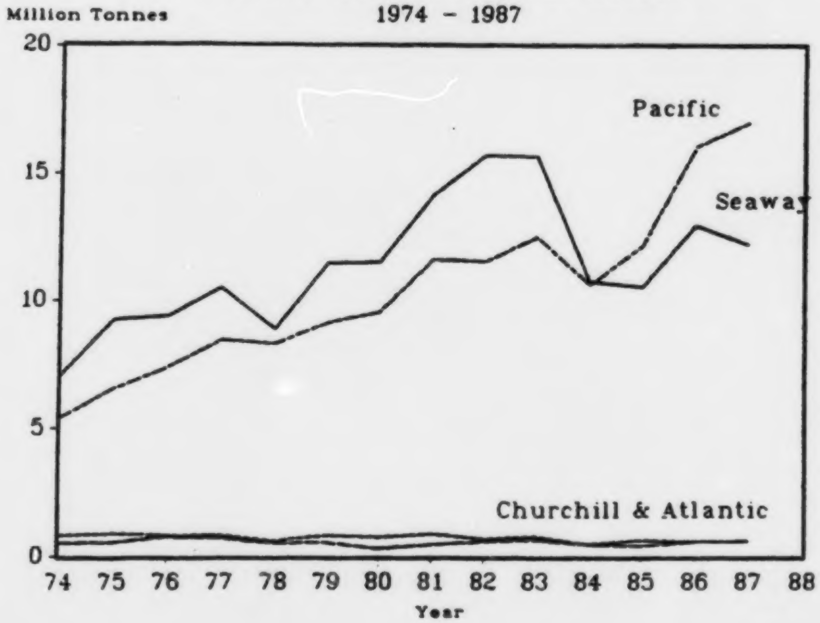
1959 - 1988



## Canadian Grain Traffic Through the Seaway
## 1959 - 1988

| Year | Montreal - Lake Ontario | Welland Canal |
|---|---|---|
| | Million Tonnes | |
| 1959 | 3.734000 | 4.328000 |
| 1960 | 3.907000 | 4.666000 |
| 1961 | 5.666000 | 6.459000 |
| 1962 | 4.624000 | 5.145000 |
| 1963 | 6.520000 | 7.167000 |
| 1964 | 8.574000 | 9.431000 |
| 1965 | 8.138000 | 8.495000 |
| 1966 | 10.10200 | 10.68600 |
| 1967 | 6.663000 | 7.351000 |
| 1968 | 5.284000 | 5.682000 |
| 1969 | 4.405000 | 5.004000 |
| 1970 | 9.202000 | 9.965000 |
| 1971 | 11.01400 | 11.87900 |
| 1972 | 11.41600 | 11.85800 |
| 1973 | 9.464000 | 10.05700 |
| 1974 | 7.791000 | 8.524000 |
| 1975 | 10.57500 | 11.47400 |
| 1976 | 10.31500 | 10.75000 |
| 1977 | 11.54800 | 12.17400 |
| 1978 | 11.91900 | 12.52900 |
| 1979 | 9.708000 | 10.40000 |
| 1980 | 13.66700 | 14.09500 |
| 1981 | 12.78700 | 13.36800 |
| 1982 | 15.40600 | 15.92500 |
| 1983 | 16.92100 | 17.09300 |
| 1984 | 15.48900 | 15.94800 |
| 1985 | 11.12000 | 11.32600 |
| 1986 | 11.40300 | 11.72900 |
| 1987 | 12.79400 | 13.20400 |
| 1988 | 9.673000 | 9.916000 |

CANADIAN GRAIN EXPORTS BY OUTLET
1974 - 1987



## Canadian Grain Exports By Outlet
1974 - 1988

Million Tonnes

| Year | Seaway | Atlantic | Churchill | Pacific |
|---|---|---|---|---|
| 1974 | 7.050000 | 0.790000 | 0.500000 | 5.380000 |
| 1975 | 9.230000 | 0.870000 | 0.520000 | 6.540000 |
| 1976 | 9.370000 | 0.790000 | 0.740000 | 7.350000 |
| 1977 | 10.49000 | 0.810000 | 0.690000 | 8.440000 |
| 1978 | 8.880000 | 0.580000 | 0.500000 | 8.300000 |
| 1979 | 11.46000 | 0.800000 | 0.520000 | 9.140000 |
| 1980 | 11.52000 | 0.730000 | 0.290000 | 9.550000 |
| 1981 | 14.15000 | 0.860000 | 0.440000 | 11.63000 |
| 1982 | 15.73000 | 0.660000 | 0.560000 | 11.52000 |
| 1983 | 15.68000 | 0.760000 | 0.620000 | 12.51000 |
| 1984 | 10.76000 | 0.450000 | 0.440000 | 10.62000 |
| 1985 | 10.54000 | 0.616000 | 0.392000 | 12.19000 |
| 1986 | 12.98700 | 0.552000 | 0.558000 | 16.07000 |
| 1987 | 12.24100 | 0.582000 | 0.569000 | 17.01000 |
| 1988 | NA | NA | NA | NA |

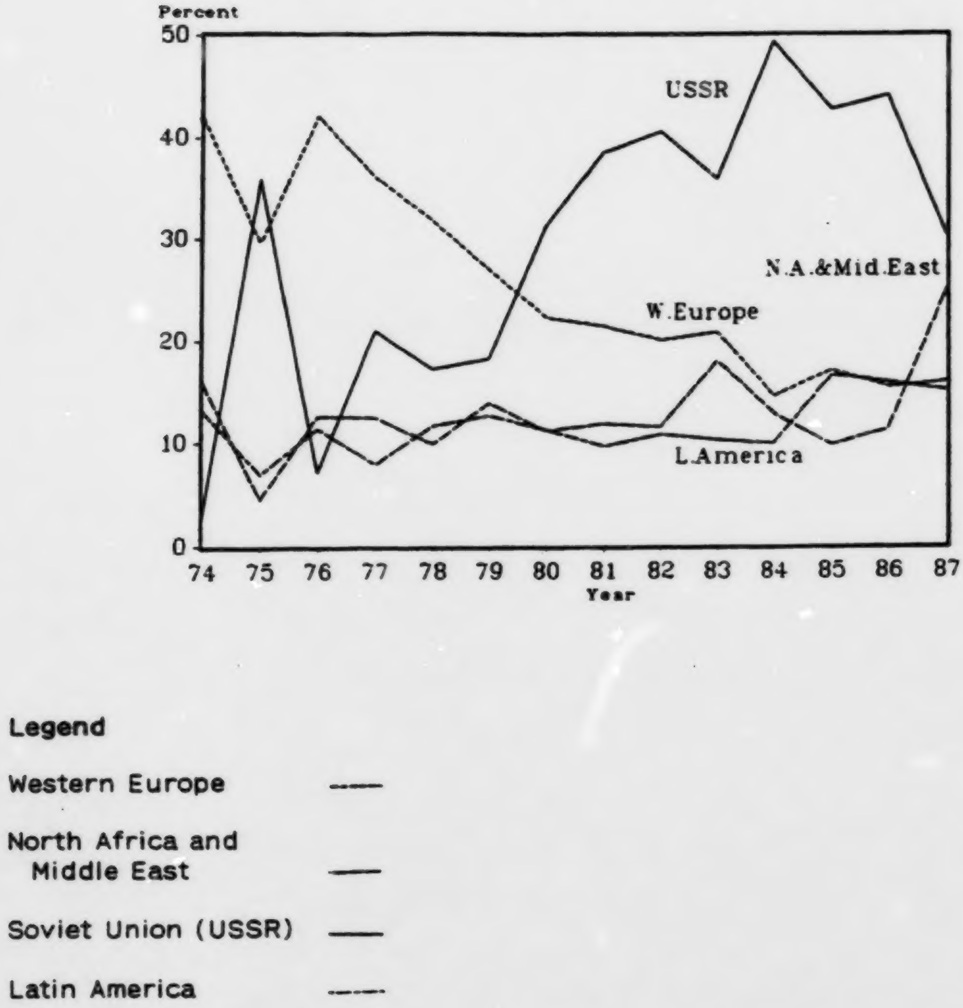
## Canadian Grain Exports By Outlet
### 1974 - 1988

| Year | Seaway | Atlantic | Churchill | Pacific |
|---|---|---|---|---|
| | | Percent | | |
| 1974 | 50.10661 | 5.614783 | 3.553660 | 38.23739 |
| 1975 | 52.74286 | 4.971428 | 2.971428 | 37.37143 |
| 1976 | 50.56665 | 4.263357 | 3.993524 | 39.66541 |
| 1977 | 51.04623 | 3.941606 | 3.357664 | 41.07056 |
| 1978 | 48.18231 | 3.147043 | 2.712968 | 45.03527 |
| 1979 | 51.90218 | 3.623189 | 2.355073 | 41.39493 |
| 1980 | 51.79857 | 3.282374 | 1.303957 | 42.94065 |
| 1981 | 51.75567 | 3.145574 | 1.609364 | 42.53841 |
| 1982 | 54.59910 | 2.290871 | 1.943770 | 39.98612 |
| 1983 | 52.51172 | 2.545211 | 2.076356 | 41.89551 |
| 1984 | 47.65279 | 1.992914 | 1.948627 | 47.03277 |
| 1985 | 44.39764 | 2.594777 | 1.651222 | 51.34794 |
| 1986 | 42.96916 | 1.826363 | 1.846215 | 53.16966 |
| 1987 | 39.84701 | 1.894531 | 1.852214 | 55.37110 |
| 1988 | NA | NA | NA | NA |

## Seaway Share of Canadian Grain Exports By Market
### 1974 - 1988

| | Destination | | | | | |
|---|---|---|---|---|---|---|
| Year | USSR | Western Europe | North Africa Middle East | Latin America | Eastern Europe | Asia |
| | Percent | | | | | |
| 1974 | 77.24300 | 57.30994 | 56.81818 | 78.38214 | 89.41290 | 19.47458 |
| 1975 | 82.02654 | 75.56693 | 70.98434 | 68.83333 | 85.65684 | 7.025547 |
| 1976 | 77.34145 | 60.84829 | 57.51074 | 68.62289 | 89.60604 | 6.167400 |
| 1977 | 86.40000 | 56.97589 | 91.70488 | 56.66090 | 73.68889 | 3.048863 |
| 1978 | 74.35897 | 72.15620 | 98.39229 | 57.32026 | 86.36742 | 5.103602 |
| 1979 | 78.87072 | 69.50026 | 54.97107 | 71.94245 | 89.97524 | 4.363082 |
| 1980 | 80.76317 | 63.08033 | 60.51437 | 81.80662 | 92.23093 | 1.552842 |
| 1981 | 88.10842 | 67.86704 | 59.20122 | 77.60779 | 81.49254 | 3.043771 |
| 1982 | 81.51695 | 75.12788 | 73.84259 | 90.63279 | 92.85325 | 3.697590 |
| 1983 | 80.06384 | 64.10761 | 77.58144 | 69.31009 | 78.34550 | 2.967938 |
| 1984 | 90.92496 | 51.15848 | 78.66666 | 53.47303 | 66.83386 | 0.000000 |
| 1985 | 80.53691 | 46.53812 | 77.37441 | 37.85477 | 62.53572 | 1.618883 |
| 1986 | 81.67346 | 28.62010 | 75.95491 | 36.38387 | 73.18893 | 4.185337 |
| 1987 | 94.70874 | 73.54369 | 78.05492 | 57.62201 | 60.42553 | 3.048245 |
| 1988 | NA | NA | NA | NA | NA | NA |

MARKET SHARE OF CANADIAN GRAIN EXPORTED VIA SEAWAY

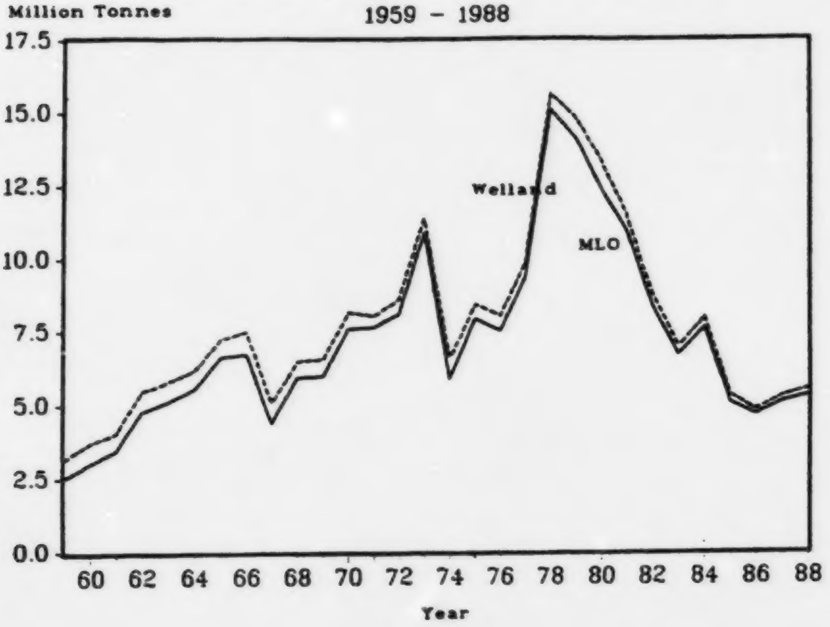


## Market Share of Canadian Grain Exported Via Seaway
## 1974 - 1988

|  |  | Destination |  |  |  |
|---|---|---|---|---|---|
| Year | USSR | Western Europe | North Africa Middle East | Latin America | Eastern Europe |
|  |  |  | Percent |  |  |
| 1974 | 2.836880 | 41.88652 | 15.94326 | 13.17731 | 4.170213 |
| 1975 | 35.86132 | 29.46912 | 4.474540 | 6.923077 | 11.19177 |
| 1976 | 7.150481 | 42.03842 | 12.60406 | 11.40875 | 11.94237 |
| 1977 | 20.97235 | 36.03432 | 12.48808 | 7.902765 | 7.435653 |
| 1978 | 17.22973 | 31.67793 | 9.876125 | 11.70045 | 14.35811 |
| 1979 | 18.23735 | 26.93717 | 13.96161 | 12.68761 | 11.77138 |
| 1980 | 31.25000 | 22.23090 | 11.16319 | 11.23264 | 7.430555 |
| 1981 | 38.44523 | 21.36396 | 11.83039 | 9.646644 | 8.657245 |
| 1982 | 40.55944 | 20.01907 | 11.56389 | 10.82009 | 7.469803 |
| 1983 | 35.84184 | 20.79719 | 18.00383 | 10.26786 | 6.230867 |
| 1984 | 49.34944 | 14.52602 | 12.80669 | 9.907063 | 5.130111 |
| 1985 | 42.66604 | 17.07780 | 9.743833 | 16.61290 | 5.037951 |
| 1986 | 44.09795 | 15.40771 | 11.32671 | 15.86972 | 2.587203 |
| 1987 | 30.42235 | 15.93824 | 24.98162 | 15.08047 | 2.475288 |
| 1988 | NA | NA | NA | NA | NA |

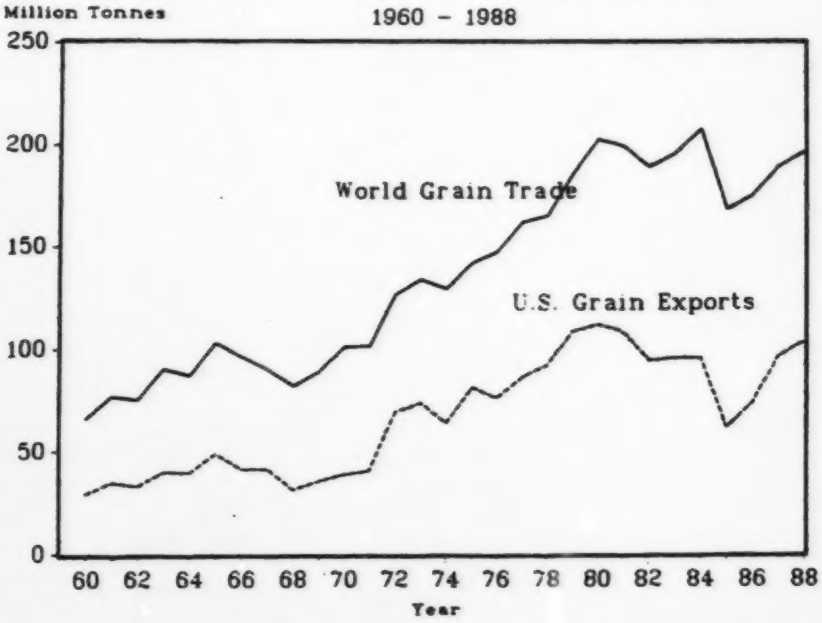
U.S. GRAIN TRAFFIC THROUGH THE SEAWAY

1959 - 1988



## United States Grain Traffic Through The Seaway
### 1959 - 1988

| Year | Montreal - Lake Ontario | Welland Canal |
|---|---|---|
| | Million Tonnes | |
| 1959 | 2.510000 | 3.143000 |
| 1960 | 2.991000 | 3.698000 |
| 1961 | 3.446000 | 4.040000 |
| 1962 | 4.775000 | 5.469000 |
| 1963 | 5.131000 | 5.787000 |
| 1964 | 5.541000 | 6.173000 |
| 1965 | 6.619000 | 7.229000 |
| 1966 | 6.726000 | 7.493000 |
| 1967 | 4.371000 | 5.045000 |
| 1968 | 5.928000 | 6.479000 |
| 1969 | 5.962000 | 6.552000 |
| 1970 | 7.578000 | 8.151000 |
| 1971 | 7.644000 | 8.033000 |
| 1972 | 8.094000 | 8.597000 |
| 1973 | 10.88800 | 11.42800 |
| 1974 | 5.882000 | 6.537000 |
| 1975 | 7.931000 | 8.426000 |
| 1976 | 7.501000 | 8.019000 |
| 1977 | 9.337000 | 9.876000 |
| 1978 | 15.07000 | 15.62900 |
| 1979 | 14.08100 | 14.77600 |
| 1980 | 12.30400 | 13.26300 |
| 1981 | 10.89700 | 11.42300 |
| 1982 | 8.305000 | 8.704001 |
| 1983 | 6.679000 | 6.948000 |
| 1984 | 7.590000 | 7.953000 |
| 1985 | 5.069000 | 5.326000 |
| 1986 | 4.622000 | 4.789000 |
| 1987 | 5.057000 | 5.256000 |
| 1988 | 5.290000 | 5.517000 |



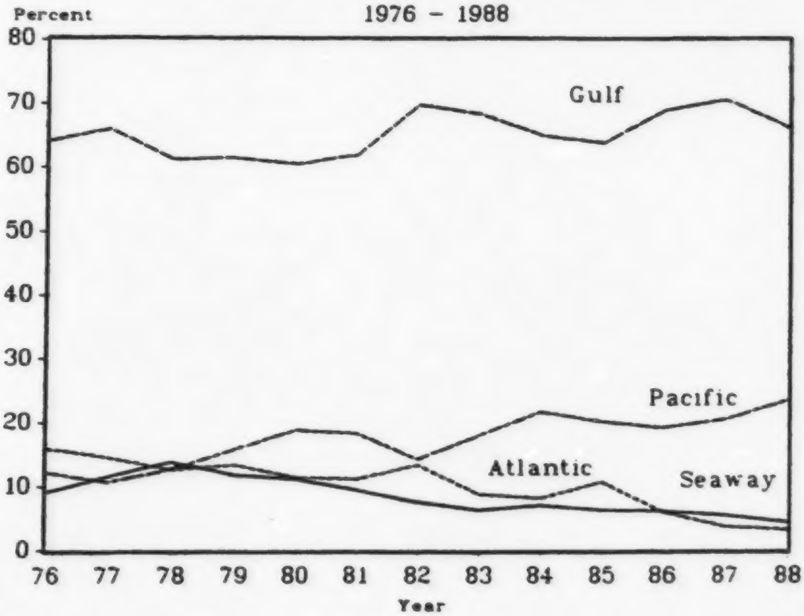
WORLD GRAIN TRADE & U.S. GRAIN EXPORTS

1960 - 1988

## World Grain Trade and U.S. Grain Exports
1959 - 1988

| Year | World Trade | U.S. Exports |
|---|---|---|
| | Million Tonnes | |
| 1959 | NA | NA |
| 1960 | 65.90000 | 29.00000 |
| 1961 | 76.80000 | 34.70000 |
| 1962 | 75.30000 | 32.90000 |
| 1963 | 90.00000 | 39.70000 |
| 1964 | 87.00000 | 39.30000 |
| 1965 | 103.0000 | 48.90000 |
| 1966 | 96.00000 | 41.10000 |
| 1967 | 90.00000 | 41.50000 |
| 1968 | 82.00000 | 31.10000 |
| 1969 | 89.00000 | 35.40000 |
| 1970 | 101.0000 | 38.80000 |
| 1971 | 101.3000 | 40.50000 |
| 1972 | 126.3000 | 69.10000 |
| 1973 | 134.1000 | 73.80000 |
| 1974 | 129.3000 | 63.60000 |
| 1975 | 141.9000 | 81.20000 |
| 1976 | 147.2000 | 76.00000 |
| 1977 | 161.8000 | 86.10000 |
| 1978 | 165.1000 | 92.00000 |
| 1979 | 185.5000 | 108.5000 |
| 1980 | 202.4000 | 111.9000 |
| 1981 | 199.1000 | 108.2000 |
| 1982 | 188.7000 | 94.10000 |
| 1983 | 195.5060 | 95.50000 |
| 1984 | 207.4000 | 95.40000 |
| 1985 | 168.2000 | 61.50000 |
| 1986 | 174.8000 | 73.60000 |
| 1987 | 188.7000 | 96.00000 |
| 1988 | 196.2000 | 103.5000 |

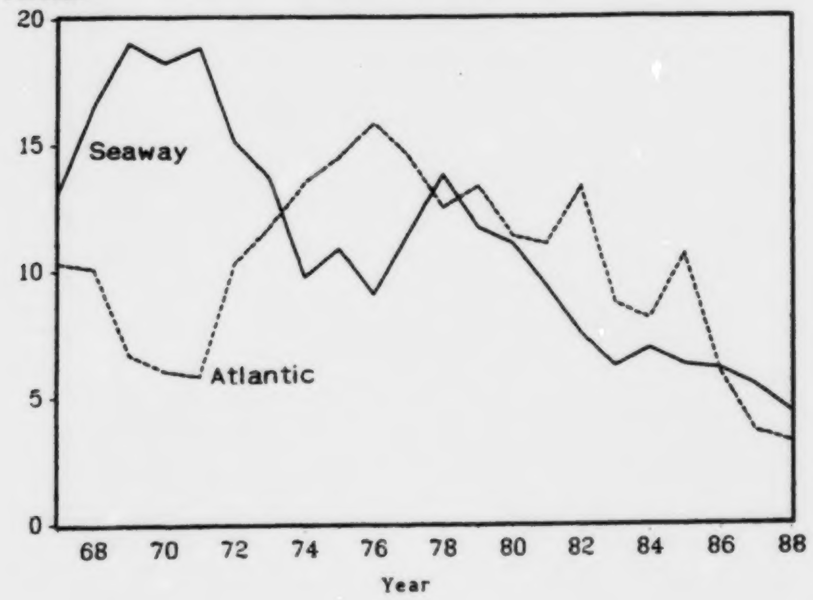
SHARE OF U.S. OUTLETS OF U.S. GRAIN EXPORTS
1976 - 1988



## Share of U.S. Outlets of U.S. Grain Exports
### 1976 - 1988

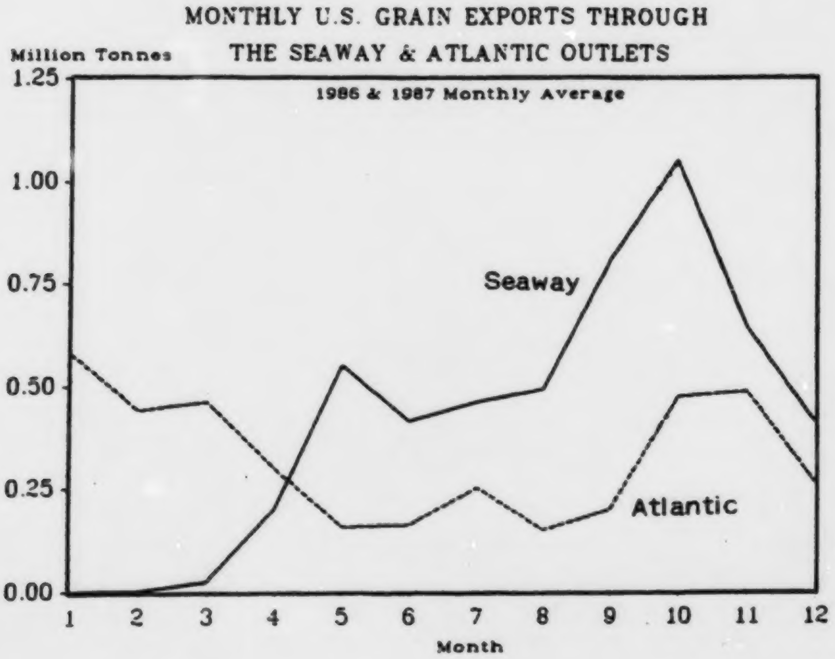
| Year | Seaway | Atlantic | Pacific | Gulf |
|---|---|---|---|---|
| | | | Percent | |
| 1976 | 9.047997 | 15.84720 | 12.10155 | 64.05637 |
| 1977 | 11.41525 | 14.51289 | 10.52314 | 65.97712 |
| 1978 | 13.76994 | 12.47399 | 12.64921 | 61.12579 |
| 1979 | 11.67381 | 13.31849 | 15.71112 | 61.38199 |
| 1980 | 11.05843 | 11.34772 | 18.81236 | 60.40603 |
| 1981 | 9.363420 | 11.02903 | 18.29753 | 61.93170 |
| 1982 | 7.521220 | 13.33045 | 14.20173 | 69.83111 |
| 1983 | 6.179422 | 8.698585 | 18.00814 | 68.22836 |
| 1984 | 6.901609 | 8.042220 | 21.63544 | 64.94595 |
| 1985 | 6.222306 | 10.66160 | 20.11196 | 63.76122 |
| 1986 | 6.069161 | 5.966500 | 19.14899 | 68.81535 |
| 1987 | 5.402976 | 3.597107 | 20.41844 | 70.58147 |
| 1988 | 4.360000 | 3.160000 | 23.42000 | 66.22000 |

Percent of U.S. Grain Exports Via Seaway and Atlantic
1967 - 1988



## Percent of U.S. Grain Exports Via Seaway and Atlantic
1967 - 1988

| Year | Seaway | Atlantic |
|---|---|---|
| | Percent | |
| 1967 | 13.12783 | 10.28105 |
| 1968 | 16.53762 | 10.05807 |
| 1969 | 19.02009 | 6.677762 |
| 1970 | 18.21563 | 6.025292 |
| 1971 | 18.83111 | 5.806436 |
| 1972 | 15.10759 | 10.24079 |
| 1973 | 13.65955 | 11.70918 |
| 1974 | 9.732499 | 13.46520 |
| 1975 | 10.85392 | 14.47838 |
| 1976 | 9.047997 | 15.84720 |
| 1977 | 11.41525 | 14.51289 |
| 1978 | 13.76994 | 12.47399 |
| 1979 | 11.67381 | 13.31849 |
| 1980 | 11.05843 | 11.34772 |
| 1981 | 9.363420 | 11.02903 |
| 1982 | 7.521220 | 13.33045 |
| 1983 | 6.179422 | 8.698585 |
| 1984 | 6.901609 | 8.042220 |
| 1985 | 6.222306 | 10.66160 |
| 1986 | 6.069161 | 5.966500 |
| 1987 | 5.402976 | 3.597107 |
| 1988 | 4.360000 | 3.160000 |

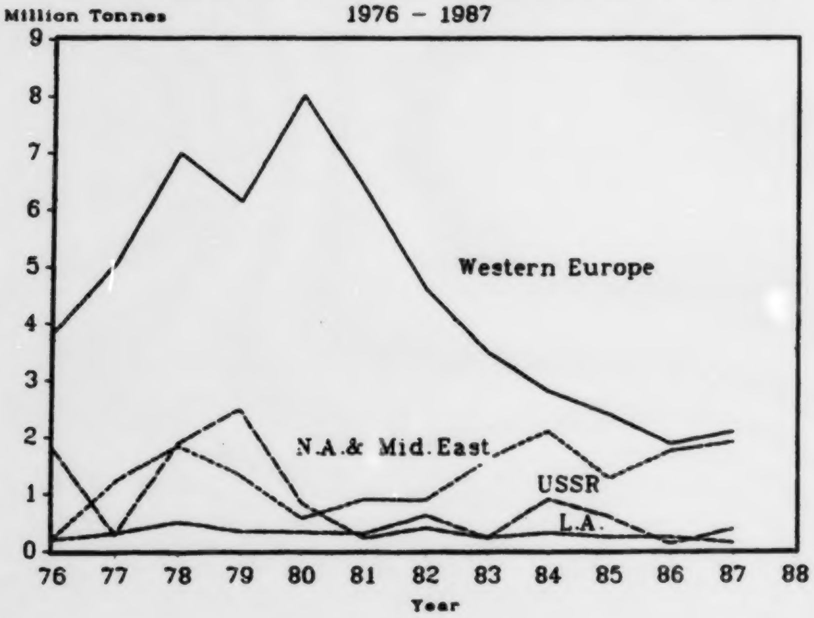
 MONTHLY U.S. GRAIN EXPORTS THROUGH THE SEAWAY & ATLANTIC OUTLETS

### Monthly U.S. Grain Exports Through the Seaway and Atlantic Outlets 1986 and 1987

| Month | Seaway | Atlantic |
|---|---|---|
| | Million Tonnes | |
| 1 | 0.000000 | 0.579000 |
| 2 | 0.000000 | 0.440000 |
| 3 | 0.023000 | 0.462000 |
| 4 | 0.199500 | 0.299000 |
| 5 | 0.550000 | 0.156000 |
| 6 | 0.414500 | 0.160000 |
| 7 | 0.460000 | 0.251500 |
| 8 | 0.492000 | 0.148000 |
| 9 | 0.808000 | 0.198000 |
| 10 | 1.051000 | 0.473000 |
| 11 | 0.644000 | 0.486000 |
| 12 | 0.410500 | 0.262500 |

U.S. GRAIN EXPORTS THROUGH THE SEAWAY BY MARKET

1976 - 1987



**Legend**

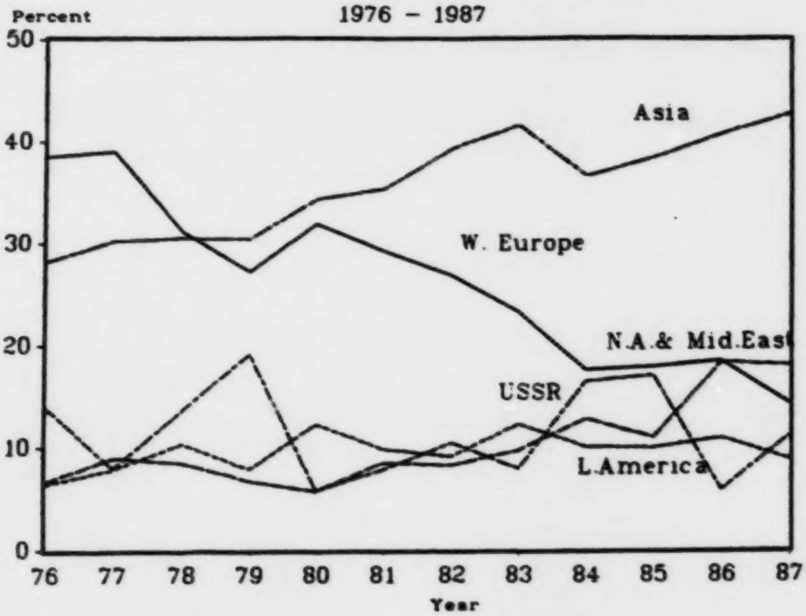
| | |
|---|---|
| Western Europe | —— |
| North Africa and Middle East | —— |
| Soviet Union (USSR) | ---- |
| Latin America | ----- |

## U.S. Grain Exports Through the Seaway by Market
### 1976 - 1988

| Year | Western Europe | Latin America | USSR Million Tonnes | North Africa Middle East | Eastern Europe |
|---|---|---|---|---|---|
| 1976 | 3.831000 | 0.192000 | 1.782000 | 0.210000 | 0.298000 |
| 1977 | 5.060000 | 0.291000 | 0.263000 | 1.207000 | 0.240000 |
| 1978 | 6.997000 | 0.496000 | 1.881000 | 1.836000 | 0.582000 |
| 1979 | 6.134000 | 0.328000 | 2.483000 | 1.320000 | 0.703000 |
| 1980 | 8.005000 | 0.316000 | 0.824000 | 0.553000 | 0.847000 |
| 1981 | 6.357000 | 0.285000 | 0.208000 | 0.888000 | 0.936000 |
| 1982 | 4.574000 | 0.606000 | 0.385000 | 0.871000 | 0.171000 |
| 1983 | 3.481000 | 0.209000 | 0.206000 | 1.591000 | 0.284000 |
| 1984 | 2.800000 | 0.299000 | 0.893000 | 2.097000 | 0.250000 |
| 1985 | 2.382000 | 0.223000 | 0.580000 | 1.253000 | 0.235000 |
| 1986 | 1.869000 | 0.221000 | 0.102000 | 1.739000 | 0.225000 |
| 1987 | 2.074000 | 0.125000 | 0.363000 | 1.892000 | 0.294000 |
| 1988 | 1.623000 | 0.107000 | 0.997000 | 2.010000 | 0.330000 |

SHARE OF EXPORT MARKETS OF U.S GRAIN

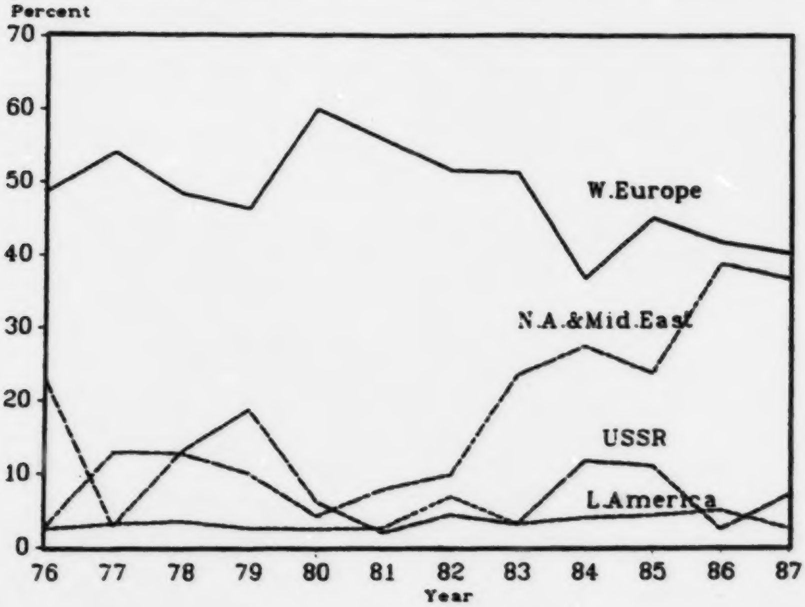
1976 - 1987



## Share of Export Markets of U.S. Grain
## 1976 - 1988

| | | | Destination | | | |
|---|---|---|---|---|---|---|
| Year | Western Europe | Asia | Latin America | USSR | North Africa Middle East | Eastern Europe |
| | | | | Percent | | |
| 1976 | 38.45339 | 28.16049 | 6.341350 | 13.91137 | 6.584755 | 5.421053 |
| 1977 | 38.93737 | 30.19241 | 7.815644 | 7.894869 | 8.937374 | 3.538908 |
| 1978 | 31.11172 | 30.50730 | 10.33509 | 13.62332 | 8.469550 | 4.166304 |
| 1979 | 27.20572 | 30.43278 | 7.838828 | 19.15977 | 6.684755 | 5.588940 |
| 1980 | 31.92600 | 34.30822 | 12.30124 | 5.779109 | 5.691944 | 6.810545 |
| 1981 | 29.26114 | 35.31311 | 9.814168 | 7.815063 | 8.491644 | 6.445471 |
| 1982 | 26.80729 | 39.31832 | 9.108914 | 10.45842 | 8.247357 | 2.934113 |
| 1983 | 23.22786 | 41.58133 | 12.28982 | 7.868810 | 9.723826 | 1.634555 |
| 1984 | 17.55697 | 36.53118 | 10.04137 | 16.43829 | 12.78186 | 1.341719 |
| 1985 | 17.84185 | 38.33217 | 9.922550 | 17.01280 | 10.92951 | 1.897561 |
| 1986 | 18.43307 | 40.69026 | 10.89153 | 5.734162 | 18.27773 | 1.808424 |
| 1987 | 14.26093 | 42.65530 | 8.780621 | 11.12261 | 17.98031 | 2.518750 |
| 1988 | NA | NA | NA | NA | NA | NA |

MARKET SHARE OF U.S. GRAIN EXPORTED VIA SEAWAY

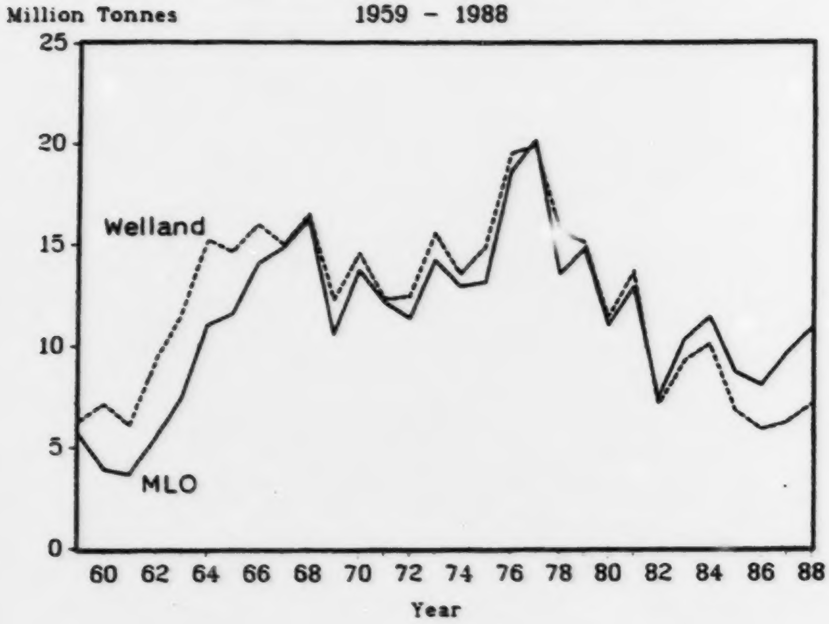


## Market Share of U.S. Grain Exported Via Seaway
### 1976 - 1988

| Year | Western Europe | Latin America | USSR Percent | North Africa Middle East | Eastern Europe |
|---|---|---|---|---|---|
| 1976 | 48.62910 | 2.437167 | 22.61996 | 2.665651 | 3.782686 |
| 1977 | 53.97333 | 3.104000 | 2.805333 | 12.87467 | 2.560000 |
| 1978 | 48.27848 | 3.422342 | 12.97868 | 12.66818 | 4.015732 |
| 1979 | 46.23850 | 2.472486 | 18.71702 | 9.950250 | 5.299262 |
| 1980 | 60.00300 | 2.368638 | 6.176449 | 4.145116 | 6.348850 |
| 1981 | 55.78762 | 2.501097 | 1.825362 | 7.792892 | 8.214129 |
| 1982 | 51.56708 | 6.832018 | 4.340474 | 9.819616 | 1.927847 |
| 1983 | 51.34218 | 3.082596 | 3.038348 | 23.46608 | 4.188791 |
| 1984 | 36.72613 | 3.921826 | 11.71301 | 27.50525 | 3.279119 |
| 1985 | 44.99433 | 4.212316 | 10.95580 | 23.66830 | 4.438987 |
| 1986 | 41.59804 | 4.918763 | 2.270198 | 38.70465 | 5.007790 |
| 1987 | 40.11605 | 2.417795 | 7.021277 | 36.59575 | 5.686654 |
| 1988 | NA | NA | NA | NA | NA |

IRON ORE TRAFFIC THROUGH THE SEAWAY

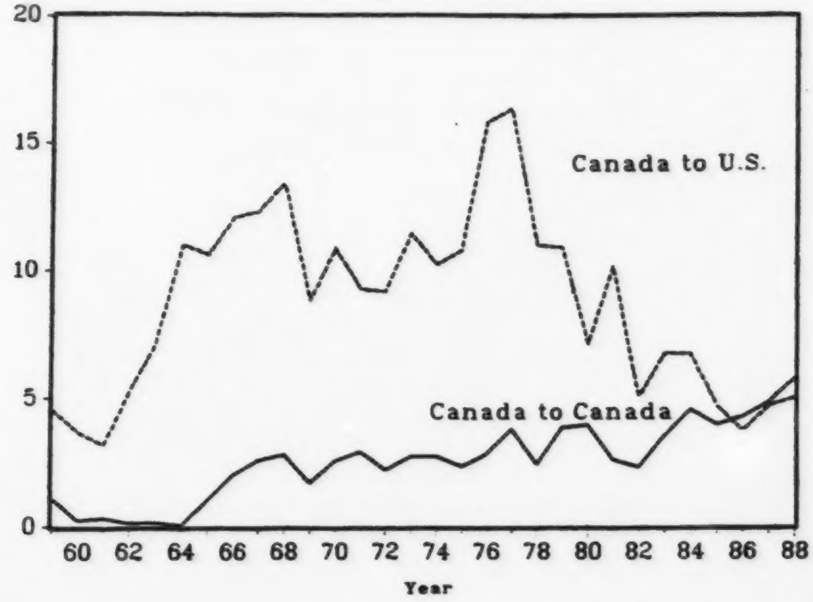
1959 - 1988



## Iron Ore Traffic Through the Seaway
1959 - 1988

| Year | Montreal - Lake Ontario | Welland Canal |
|---|---|---|
| | Million Tonnes | |
| 1959 | 5.620000 | 6.274000 |
| 1960 | 3.915000 | 7.127000 |
| 1961 | 3.644000 | 6.053000 |
| 1962 | 5.457000 | 9.313000 |
| 1963 | 7.402000 | 11.57200 |
| 1964 | 11.02900 | 15.26800 |
| 1965 | 11.58800 | 14.63700 |
| 1966 | 14.06700 | 16.01700 |
| 1967 | 14.88000 | 15.00200 |
| 1968 | 16.26800 | 16.55900 |
| 1969 | 10.56800 | 12.25800 |
| 1970 | 13.71500 | 14.59800 |
| 1971 | 12.18100 | 12.33200 |
| 1972 | 11.37000 | 12.45800 |
| 1973 | 14.23500 | 15.58800 |
| 1974 | 12.96500 | 13.52900 |
| 1975 | 13.15900 | 14.94000 |
| 1976 | 18.62900 | 19.54900 |
| 1977 | 20.20500 | 19.92700 |
| 1978 | 13.54200 | 15.68000 |
| 1979 | 14.81700 | 15.11800 |
| 1980 | 11.00500 | 11.41800 |
| 1981 | 12.92700 | 13.73600 |
| 1982 | 7.430000 | 7.016000 |
| 1983 | 10.28000 | 9.229000 |
| 1984 | 11.42200 | 10.08900 |
| 1985 | 8.679000 | 6.789000 |
| 1986 | 8.026000 | 5.840000 |
| 1987 | 9.557000 | 6.181000 |
| 1988 | 10.81100 | 7.084000 |

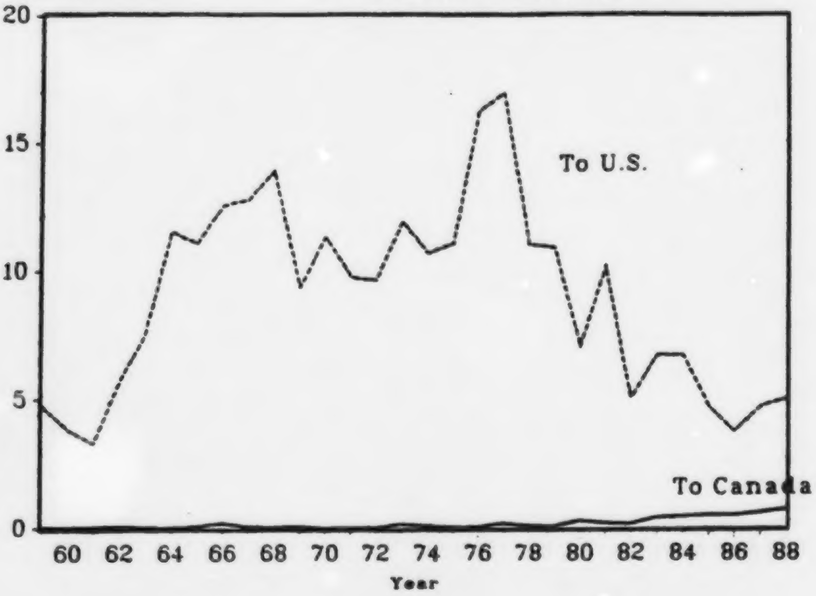
## IRON ORE UPBOUND TRAFFIC THROUGH THE MLO TO THE U.S. & CANADA



## Iron Ore Upbound Traffic Through the MLO to the U.S. and Canada 1959 - 1988

| Year | Canada | United States |
|---|---|---|
| | Million Tonnes | |
| 1959 | 1.071000 | 4.528000 |
| 1960 | 0.221000 | 3.646000 |
| 1961 | 0.295000 | 3.155000 |
| 1962 | 0.109000 | 5.270000 |
| 1963 | 0.141000 | 7.165000 |
| 1964 | 0.032000 | 10.99700 |
| 1965 | 0.988000 | 10.60100 |
| 1966 | 1.987000 | 12.08000 |
| 1967 | 2.565000 | 12.31500 |
| 1968 | 2.790000 | 13.47900 |
| 1969 | 1.662000 | 8.816000 |
| 1970 | 2.534000 | 10.89300 |
| 1971 | 2.906000 | 9.275000 |
| 1972 | 2.184000 | 9.186000 |
| 1973 | 2.736000 | 11.48200 |
| 1974 | 2.730000 | 10.23500 |
| 1975 | 2.328000 | 10.81800 |
| 1976 | 2.814000 | 15.81500 |
| 1977 | 3.783000 | 16.38100 |
| 1978 | 2.414000 | 10.99900 |
| 1979 | 3.862000 | 10.90800 |
| 1980 | 3.950000 | 7.055000 |
| 1981 | 2.587000 | 10.22700 |
| 1982 | 2.299000 | 5.000000 |
| 1983 | 3.523000 | 6.757000 |
| 1984 | 4.548000 | 6.725000 |
| 1985 | 3.934000 | 4.685000 |
| 1986 | 4.267000 | 3.698000 |
| 1987 | 4.814000 | 4.690000 |
| 1988 | 5.741000 | 5.002000 |

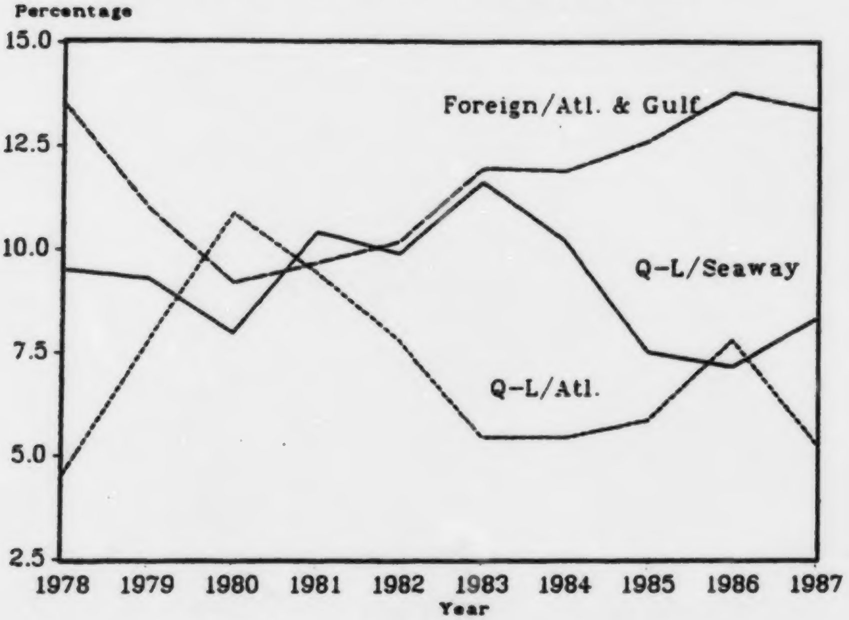
IRON ORE UPBOUND TRAFFIC THROUGH THE WELLAND
TO THE U.S. & CANADA



## Iron Ore Upbound Traffic Through the Welland to the U.S. and Canada
### 1959 - 1988

| Year | Canada | United States |
|---|---|---|
| | Million Tonnes | |
| 1959 | 0.033000 | 4.743000 |
| 1960 | 0.000000 | 3.801000 |
| 1961 | 0.040000 | 3.262000 |
| 1962 | 0.044000 | 5.681000 |
| 1963 | 0.031000 | 7.557000 |
| 1964 | 0.003000 | 11.54300 |
| 1965 | 0.042000 | 11.05600 |
| 1966 | 0.179000 | 12.56500 |
| 1967 | 0.034000 | 12.78400 |
| 1968 | 0.012000 | 13.93900 |
| 1969 | 0.040000 | 9.347000 |
| 1970 | 0.000000 | 11.36200 |
| 1971 | 0.006000 | 9.767000 |
| 1972 | 0.000000 | 9.653000 |
| 1973 | 0.131000 | 11.95000 |
| 1974 | 0.067000 | 10.68000 |
| 1975 | 0.030000 | 11.09300 |
| 1976 | 0.029000 | 16.27300 |
| 1977 | 0.156000 | 16.99600 |
| 1978 | 0.065000 | 11.04000 |
| 1979 | 0.054000 | 10.92600 |
| 1980 | 0.264000 | 7.055000 |
| 1981 | 0.187000 | 10.22700 |
| 1982 | 0.134000 | 5.012000 |
| 1983 | 0.389000 | 6.757000 |
| 1984 | 0.426000 | 6.725000 |
| 1985 | 0.462000 | 4.713000 |
| 1986 | 0.467000 | 3.725000 |
| 1987 | 0.569000 | 4.686000 |
| 1988 | 0.695000 | 5.002000 |

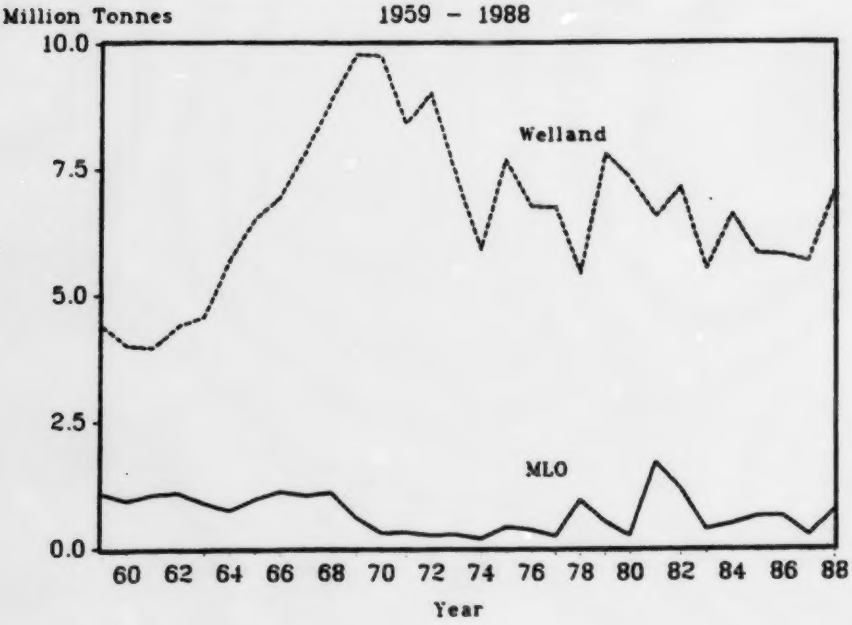
Share of U.S. Iron Ore Receipts by Route



## Share of U.S. Iron Ore Receipts by Route
## 1978 - 1988

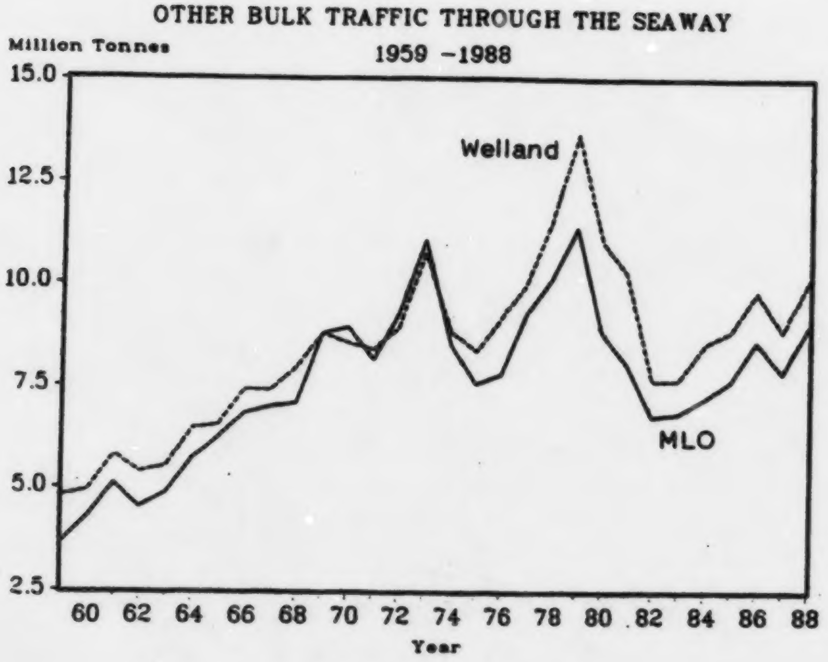
| Year | Quebec-Labrador via Seaway | Quebec-Labrador via Atlantic | Mesabi to Great Lakes | Foreign via Atlantic & Gulf |
|---|---|---|---|---|
| | | Percent | | |
| 1978 | 9.512322 | 4.538170 | 61.50353 | 13.48440 |
| 1979 | 9.278823 | 7.772267 | 62.02697 | 10.97391 |
| 1980 | 7.963923 | 10.86615 | 61.26746 | 9.185321 |
| 1981 | 10.41387 | 9.429101 | 62.86713 | 9.670455 |
| 1982 | 9.891064 | 7.789311 | 64.90764 | 10.17919 |
| 1983 | 11.62695 | 5.444377 | 67.99966 | 11.96249 |
| 1984 | 10.20145 | 5.436729 | 70.11469 | 11.90346 |
| 1985 | 7.511116 | 5.860041 | 71.76917 | 12.62530 |
| 1986 | 7.145734 | 7.805636 | 68.24416 | 13.79846 |
| 1987 | 7.900000 | 5.700000 | 71.90000 | 13.40000 |

## COAL TRAFFIC THROUGH THE SEAWAY



## Coal Traffic Through the Seaway
## 1959 - 1988

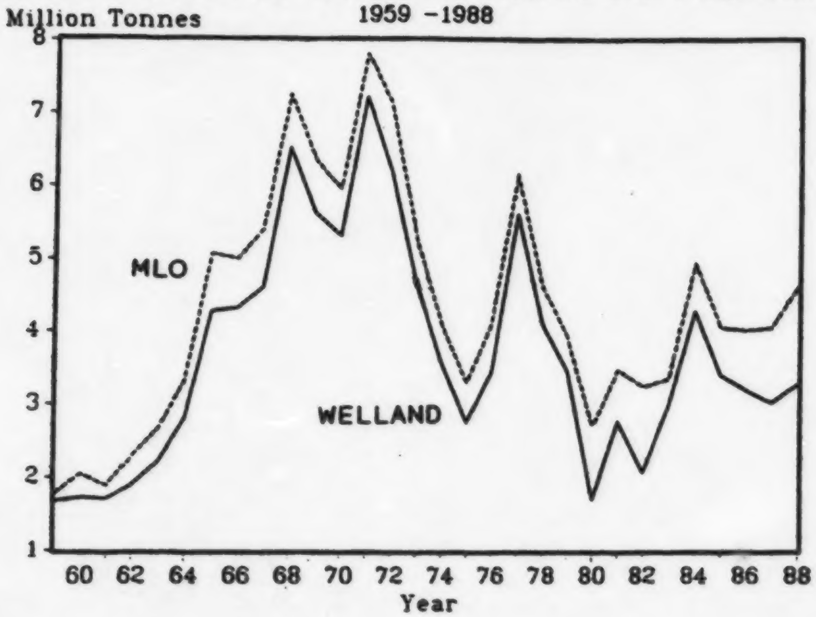
| Year | Montreal - Lake Ontario | Welland Canal |
|---|---|---|
| | Million Tonnes | |
| 1959 | 1.071000 | 4.394000 |
| 1960 | 0.926000 | 3.989000 |
| 1961 | 1.048000 | 3.952000 |
| 1962 | 1.076000 | 4.401000 |
| 1963 | 0.883000 | 4.572000 |
| 1964 | 0.727000 | 5.709000 |
| 1965 | 0.946000 | 6.515000 |
| 1966 | 1.112000 | 6.951000 |
| 1967 | 1.030000 | 7.883000 |
| 1968 | 1.089000 | 8.885000 |
| 1969 | 0.588000 | 9.789000 |
| 1970 | 0.288000 | 9.763000 |
| 1971 | 0.300000 | 8.386000 |
| 1972 | 0.244000 | 9.031000 |
| 1973 | 0.252000 | 7.384000 |
| 1974 | 0.175000 | 5.882000 |
| 1975 | 0.399000 | 7.701000 |
| 1976 | 0.346000 | 6.744000 |
| 1977 | 0.216000 | 6.734000 |
| 1978 | 0.940000 | 5.408000 |
| 1979 | 0.502000 | 7.791000 |
| 1980 | 0.226000 | 7.293000 |
| 1981 | 1.675000 | 6.543000 |
| 1982 | 1.154000 | 7.141000 |
| 1983 | 0.350000 | 5.495000 |
| 1984 | 0.453000 | 6.603000 |
| 1985 | 0.607000 | 5.808000 |
| 1986 | 0.610000 | 5.776000 |
| 1987 | 0.234000 | 5.644000 |
| 1988 | 0.713000 | 7.029000 |


OTHER BULK TRAFFIC THROUGH THE SEAWAY
1959 -1988
Million Tonnes
15.0
12.5
10.0
7.5
5.0
2.5
60
62
64
66
68
70
72
74
76
78
80
82
84
86
88
Year
Welland
MLO

## Other Bulk Traffic Through the Seaway
## 1959 - 1988

| Year | Montreal - Lake Ontario | Welland Canal |
|---|---|---|
| | Million Tonnes | |
| 1959 | 3.648841 | 4.798549 |
| 1960 | 4.280298 | 4.929982 |
| 1961 | 5.091331 | 5.815974 |
| 1962 | 4.506064 | 5.376007 |
| 1963 | 4.861155 | 5.524907 |
| 1964 | 5.712656 | 6.460454 |
| 1965 | 6.230446 | 6.544371 |
| 1966 | 6.814746 | 7.412239 |
| 1967 | 6.988689 | 7.389912 |
| 1968 | 7.080774 | 7.953764 |
| 1969 | 8.785130 | 8.777886 |
| 1970 | 8.939248 | 8.552536 |
| 1971 | 8.136169 | 8.385622 |
| 1972 | 9.269143 | 8.926295 |
| 1973 | 11.07835 | 10.74719 |
| 1974 | 8.490373 | 8.821654 |
| 1975 | 7.544878 | 8.324824 |
| 1976 | 7.785525 | 9.172925 |
| 1977 | 9.265234 | 10.00268 |
| 1978 | 10.12331 | 11.57935 |
| 1979 | 11.37719 | 13.68385 |
| 1980 | 8.796077 | 11.05432 |
| 1981 | 8.043736 | 10.24832 |
| 1982 | 6.748902 | 7.623813 |
| 1983 | 6.822962 | 7.629326 |
| 1984 | 7.190512 | 8.510558 |
| 1985 | 7.614905 | 8.832600 |
| 1986 | 8.580438 | 9.794485 |
| 1987 | 7.808454 | 8.813868 |
| 1988 | 8.960287 | 10.09042 |

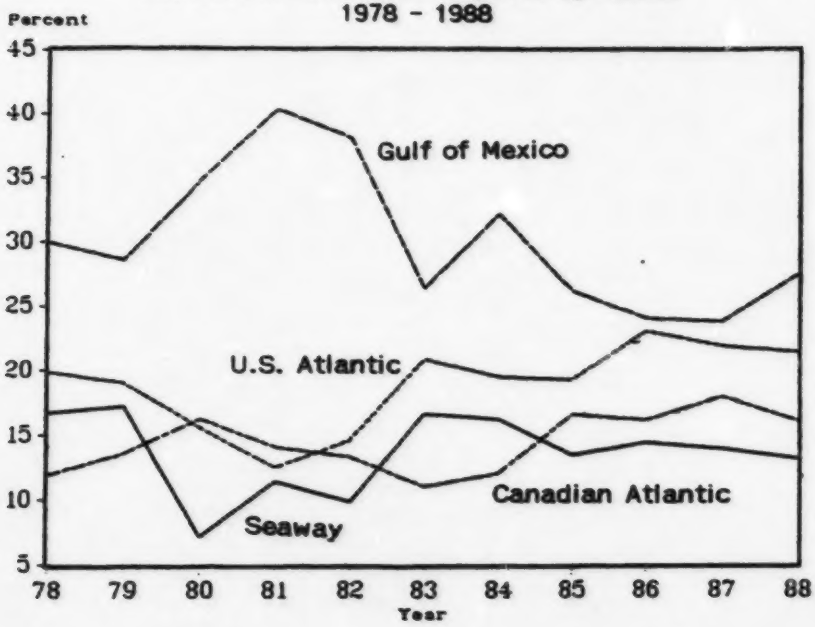
GENERAL GARGO TRAFFIC THROUGH THE SEAWAY



## General Cargo Traffic Through the Seaway
### 1959 - 1988

| Year | Montreal - Lake Ontario | Welland Canal |
|---|---|---|
| | Million Tonnes | |
| 1959 | 1.769158 | 1.672452 |
| 1960 | 2.044701 | 1.716018 |
| 1961 | 1.881667 | 1.704026 |
| 1962 | 2.283935 | 1.887992 |
| 1963 | 2.667844 | 2.210095 |
| 1964 | 3.335343 | 2.802546 |
| 1965 | 5.061553 | 4.263630 |
| 1966 | 4.979255 | 4.312762 |
| 1967 | 5.409313 | 4.604089 |
| 1968 | 7.260224 | 6.515234 |
| 1969 | 6.339872 | 5.518113 |
| 1970 | 5.939754 | 5.193464 |
| 1971 | 7.816832 | 6.976380 |
| 1972 | 7.117856 | 5.903705 |
| 1973 | 5.284650 | 4.409812 |
| 1974 | 4.102627 | 3.453345 |
| 1975 | 3.282122 | 2.603175 |
| 1976 | 4.116474 | 3.259075 |
| 1977 | 6.161768 | 5.294318 |
| 1978 | 4.330208 | 3.888651 |
| 1979 | 3.679582 | 3.260152 |
| 1980 | 2.512868 | 1.555679 |
| 1981 | 3.405520 | 2.727685 |
| 1982 | 3.183619 | 2.009186 |
| 1983 | 3.284966 | 2.950674 |
| 1984 | 4.797806 | 4.162442 |
| 1985 | 3.932423 | 3.318402 |
| 1986 | 3.951620 | 3.164514 |
| 1987 | 4.002603 | 2.990130 |
| 1988 | 4.565859 | 3.245577 |

## Percent of U.S. Steel Imports by Route
## 1978 - 1988



## Percent of U.S. Steel Imports by Route
1978 - 1988

| Year | Seaway | Gulf of Mexico | U.S. Atlantic | Canadian Atlantic |
|---|---|---|---|---|
| | | Percent | | |
| 1978 | 16.67362 | 29.93637 | 19.82894 | 11.89632 |
| 1979 | 17.19841 | 28.55705 | 18.99188 | 13.57372 |
| 1980 | 7.121514 | 34.80365 | 15.53074 | 16.25640 |
| 1981 | 11.39486 | 40.36672 | 12.50277 | 14.05938 |
| 1982 | 9.817411 | 38.09870 | 14.61366 | 13.32363 |
| 1983 | 16.63438 | 26.37866 | 20.87692 | 11.00994 |
| 1984 | 16.20039 | 32.19011 | 19.47839 | 12.06708 |
| 1985 | 13.48846 | 26.19524 | 19.28286 | 16.58335 |
| 1986 | 14.42041 | 24.09439 | 23.09291 | 16.14639 |
| 1987 | 13.92531 | 23.79530 | 21.87552 | 17.96404 |
| 1988 | 13.14901 | 27.44829 | 21.42254 | 16.04580 |

## *APPENDIX B*

### *Forecasting St Lawrence Seaway Traffic*

The following is a summary of the major factors which are generally accepted as affecting commodity flows through the Great Lakes/St. Lawrence Seaway. These should be considered and reviewed when developing assumptions for future System commodity flow scenarios. Not specifically mentioned, but clearly important is the rapidly evolving political and economic scene in Eastern Europe and, to a lesser but still important extent, Asia.

- Commodity Supply and Demand
    - Production
    - Consumption
    - Exports
    - Imports
    - Stock
- Trade Relations
- Oil Prices
- Transportation costs and rates
    - Seaway Tolls
    - Domestic Transportation Rates
    - Ocean Rates
- Protectionist and Subsidy Policies
    - U.S. Steel Import Quotas
    - U.S. Voluntary Restraint Agreement (VRA)
    - U.S. Export Enhancement Program (EEP)
    - U.S. Bonus Incentive Commodities Export Program (BICEP)
    - E.E.C. Common Agricultural Program (CAP)
- Domestic Transportation Policies
    - National Transportation Act, 1987

- Western Grain Transportation Act (WGTA)
- "At and East"
- U.S. Ad Valorem Tax
- SLSDC Toll Rebate
- U.S. Jones Act

## Assumptions for a High Level Forecast

Following are the major assumptions which serve to generate an optimistic Seaway traffic forecast.

### Grain

- Softening of world grain demand until 1989 followed by a stronger period
- U.S. - E.E.C. agricultural trade war resolved by 1990
- Oil price increase after 1990
- Soviet Union remains major grain importer after 1990
- Western Europe stabilizes grain import levels from North America
- Asian grain market will grow moderately; imports from North America not as strong as current trends would indicate
- North Africa and Middle East market for grain grows according to projected current trends
- Latin America market for grain grows as projected
- WGTA impact diluted as the result of stronger world grain markets and or domestic efforts to decrease the distorting effect of this Act.[98] Hence, the Great Lakes/St. Lawrence Seaway System share of total Canadian grain exports returns to a level above 50%
- Moderate success of the U.S. BICEP resulting in stronger U.S. grain exports after 1990. Hence, Seaway share of total U.S. grain exports increases above 6%

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[98] It is noted that this *optimistic* forecast does not go so far as to suggest changes to the WGTA.

## Iron Ore and Steel

- Steel demand expected to grow by an annual average of 0.6% in the U.S. and by 1.5% in Canada
- U.S. iron and steel imports should average 22% during 1987-1990 and 25% during 1991-1996
- U.S. raw steel production is anticipated to grow marginally due to the expected improvement in the yield ratio between finished steel and raw steel and by the rise in import share
- U.S. steel mills in the Great Lakes/St. Lawrence Seaway region will produce a smaller share of total U.S. production due to technological inefficiencies
- Canadian steel mills will perform better due to technological advantages

## Coal

- Gradual decline or stabilization of thermal coal shipments via the Seaway to Ontario Hydro power plants since most of the coal imported by these facilities will be consumed by coal-fired stations located outside the Seaway region. A shortfall in the ability of these plants as well as nuclear plants to meet future demand could lead to higher levels of electric generation at Lake Ontario plants and to correspondingly higher coal traffic on the Welland Canal
- Cement plants should slightly increase their demand for thermal coal
- Metallurgical coal traffic on the Welland is expected to grow moderately reflecting increasing steel production by the Canadian steel industrial complex in the Hamilton and Nanticoke areas

## Other Bulk

This group of commodity flows should continue in a moderate upward trend.

## Assumptions for a Low Level Forecast

The following are the major assumptions which were found to derive a low level forecast:

### Grain

- Softening of world grain demand until 1996
- Oil prices remain low until after 1996
- Soviet Union and other Eastern Bloc countries achieve relative self-sufficiency after 1990 and reduce their grain[99] imports from North American sources
- Western Europe imports from North America continue to decline
- Asian market grows relatively in importance due to the less than moderate success of China's agriculture policy
- North Africa and Middle East market for grain grows as expected but financial constraints limit their import capabilities
- Latin America market for grain grows as expected
- Canadian grain industry continues to face a competitive market as a result of the unresolved U.S. E.E.C. agricultural trade war and the increasing dependence of developing countries on food aid programs
- Seaway share of total Canadian grain exports falls below 50% as the result of a growing market in Asia relative to the traditional Seaway markets in Europe, and the CWB's choice to export grain through the Pacific terminals due to advantageous domestic transportation rates as a result of the WGTA
- Low levels of U.S. grain exports continue due to fierce competition in world markets and the failure of the U.S. grain export enhancement program
- Depressed economic conditions in the U.S. weaken commodity flows through the U.S. transportation system and decrease domestic freight rates. As a result, the Great Lakes - St. Lawrence Seaway experience stiffer competition from alternative systems and its share of U.S. grain Exports remain below 6%.

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[99] The current economic circumstances in the Soviet Union and Eastern Europe, and the political changes that could revolutionize the agricultural sector, suggest a much wider range of possibilities than previously envisaged. Among a plethora of credible scenarios, return to small independent farmers could reduce the availability of grain but dramatically increase production and availability of substitute foods.

## Iron Ore and Steel

- Low steel demand continues in Canada and the U.S. as a result of insignificant real growth in these economies beyond 1986
- U.S. steel imports fall below 20% due to protective government policy
- Further reductions in U.S. raw steel production, particularly in U.S. steel mills located within the Great Lakes-Seaway region Stiffer competition from alternative routes and modes as a result of national and corporate priorities

## Coal

- Gradual decline or stabilization of thermal coal shipments via the Seaway to Ontario Hydro power plants since most of the coal imported by these facilities will be consumed by coal-fired stations outside the Seaway region. The expansion of nuclear plants will also have a negative effect on this traffic
- Cement plants should slightly increase their demand for thermal coal
- Metallurgical coal traffic on the Welland is expected to grow moderately reflecting increasing steel production by the Canadian steel industrial complex in the Hamilton and Nanticoke areas

## Other Bulk

This group of commodity flows should continue in a moderate upward trend.

The above are not intended to be, in any way, definitive. The objective is to stimulate the reader to formalize her/his presumptions with respect to the factors that underlie demand for the transportation services whose future is to be forecast.

## REVIEW OF TRAFFIC FORECASTS THROUGH THE GREAT LAKES/ST. LAWRENCE SEAWAY IN 2000

(In Millions of Tonnes)

| Forecast Authority & Date of Study* | Commodity | Great Lakes/Seaway Sections | |
|---|---|---|---|
| | | MLO | Welland Canal |
| ACRES/DRI<br>Feb., 1982 | Grain | 43.5 | 44.7 |
| | Canadian Grain | 20.8 | 21.2 |
| | U.S. Grain | 22.7 | 23.5 |
| SLSA/Ghonima<br>Feb., 1986 | Grain | 22.4 - 31.3 | 23.0 - 32.6 |
| | Canadian Grain | 14.2 - 18.5 | 14.5 - 19.0 |
| | U.S. Grain | 8.2 - 12.8 | 8.5 - 13.6 |
| Transport Canada/<br>Economic Analysis<br>Feb., 1988 | Canadian Grain | N/A | 16.5 - 19.1 |
| ACRES/DRI<br>Feb., 1982 | Iron Ore | 17.3 | 17.3 |
| SLSA/Ghonima<br>Feb., 1986 | Iron Ore | 10.1 - 14.8 | 9.2 - 12.9 |
| ACRES/DRI<br>Feb., 1982 | Coal | 3.45 | 10.1 |
| SLSA/Ghonima<br>Feb., 1986 | Coal | 0.6 - 0.9 | 5.1 - 7.3 |
| ACRES/DRI<br>Feb., 1982 | Other Bulk | 10.2 | 12.5 |
| SLSA/Ghonima<br>Feb., 1986 | Other Bulk | 6.0 - 9.0 | 8.0 -12.0 |
| ACRES/DRI<br>Feb., 1982 | General Cargo | 5.7 | 5 |
| SLSA/Ghonima<br>Feb., 1986 | General Cargo | 3.0 - 5.5 | 2.7 - 5.0 |
| ACRES/DRI<br>Feb., 1982 | Total Cargo | 80.1 | 89.7 |
| SLSA/Ghonima<br>Feb., 1986 | Total Cargo | 43.2 - 65.0 | 49.5 - 73.3 |

NOTE: * These are the most recent and the only forecast studies which deal with the entire Great Lakes/St. Lawrence Seaway traffic to the year 2000.

# APPENDIX C

## An Opaque Market
## Regulatory Evolution

The first deregulatory step that detracted from the transparency of the market within which Great Lakes carriers operate, and impacted the Great Lakes/St Lawrence System was the granting of the "agricultural exemption" to the rail mode by the Interstate Commerce Commission (ICC). This effectively meant that U.S. railways no longer had to publish open tariffs on commodities such as wheat and corn. The exemption was later extended to include such other "agricultural products" as forest products.

In 1980, the U.S. Congress passed the Staggers Rail Act of 1980 and the Motor Vehicle Transport Act of 1980. These statutes effectively deregulated the pricing activities of railways and motor carriers. The obvious effect was confidential contracting and reduced price transparency. The real effect was to make these carriers more competitive and to increase competition within and between modes. Shortly thereafter, the Interstate Commerce Commission exempted COFC/TOFC (containers on flat car/trailers on flat car) from residual regulation. They would now be treated similarly to agricultural commodities. In a further decision, the ICC exempted boxcar traffic from regulation. Major segments of traffic were now almost totally exempt from ICC regulation. Even the requirement to file confidential contracts with the ICC was absent.

At the same time trucking in the United States was undergoing massive structural changes with many companies going out of business and being replaced with new small entries, often driver owned. Rates fell and competition increased.

While much of the traffic mentioned above, COFC/TOFC in particular, was not traditionally attracted to movement on the Great Lakes St. Lawrence System, the increased competition in the surface modes produced effects felt by the System. Other aspects of the regulatory changes did impact directly on the System and on some of its competitors, the agricultural exemption in particular had an impact.

Changes in the United States brought pressure for change in Canada, and particularly in response to representations by the Canadian railways, the Minister of Transport requested the Canadian Transport Commission to conduct two Inquiries into the effects of U.S. deregulation on Canadian carriers and shippers. This was followed by a policy paper entitled "Freedom to Move" and draft legislation which ultimately became the National Transportation Act, 1987 and the Motor Vehicle Transport Act, 1987. In addition to changes in the surface mode, the NTA, 1987 also repealed the Transport Act thereby removing rate regulation on non-bulk freight on the Great Lakes St/Lawrence System.

Another statute that has had a major impact on the System is the Western Grain Transportation Act which was passed in 1983. It replaced the former Railway Act provisions concerning rates for grain originating in western Canada and shipped by rail to Thunder Bay and Armstrong, Ontario and to Vancouver and Prince Rupert for export. The subsidy payment provisions specified by this statute effect the relative economics of grain exports from Thunder Bay and west coast ports. Another change that will have some effect on traffic in the System is the proposed repeal of the "At and East" rates on grain and flour. While this change was announced in the Budget Speech and is planned via the amendment of the NTA, 1987 through Bill C-26, this Bill has not yet been passed into law. When enacted, shipping patterns will undoubtedly change, although exactly how is not yet known. Another matter under review is the feed freight assistance program mandated under the Livestock Feed Assistance Act.

## *APPENDIX D*

## *Vessel Costing Model*
## *Economies from Foreign Built Vessels*

To investigate the sensitivity of transportation cost to increasing degrees of *deCanadianization* the *Vessel Costing Model* was modified to focus on the significant parameters concerned. For a *base case*, a Seaway Maximum bulker moving Grain from Thunder Bay to Quebec with iron ore backhaul from Sept Iles to Hamilton was selected. Vessel parameters used are:

```
Vessel Dimensions and Performance Information for LAKE BULKER
-------------------------------------------------------------------
            Gross Registered Tonnage =  20200
                         Length (m.) = 222.50
                        Breadth (m.) = 23.00
                          Depth (m.) = 12.80
       Draught Loaded in Seaway (m.) =  7.92
        Draught Empty in Seaway (m.) =  6.00
             Cargo Capacity (tonnes) = 27500
   Speed Empty in Open Water (knots) = 11.5
  Speed Loaded in Open Water (knots) = 10.5
Fuel Consumption Rate in Port (tons Marine Diesel/Day) = 2.10
Generator Fuel Consumption Rate in Navigation (tons
          of Marine Diesel Fuel/Day) =  5.43
Main Engine Fuel Consumption Rate in Navigation (tons
            of Main Engine Fuel/Day) = 14.86
                     Crew Complement = 24
               Annual Operating Days = 260
```

The principal question focuses on the decision to maintain the Canadian fleet through new investment. Thus, a newbuilt vessel capital cost of $ 35 million is presumed. To avoid overstating the case against continuing viability of the *status quo*, Vessel utilization of 100% over a 260 day season and optimistic financial parameters were selected.

```
                   Newbuilding Price and Financial Information
                   -------------------------------------------

                        Newbuilding Price = $35,000,000
         Price representative of recently built Great Lake ships
                   Debt/Equity Financing = 0.60/0.40
                            Cost of Debt = 10.0 % per annum
                  Average Cost of Equity = 15.0 % per annum
                     Equity Risk Premium =  0.0 % per annum
                 Marginal Cost of Equity = 15.0 % per annum
                      Corporate Tax Rate = 50.0 % per annum
        Inflation Adjustment for Real Rate =  4.0 % per annum
       Weighted Cost of Capital after Tax =  6.7 % per annum
                  Capital Cost Allowance = 1/6,1/3,1/3,1/6
                          Economic Life = 25 YEARS
```

The modest inflation adjusted after tax cost of capital, resulting from reduction of the before tax rate by the inflation component, eliminates the element of *front end loading* of most capital cost treatments. It would seem the lowest figure that is financially defensible. The discounted (present value) benefits from the 1/6, 1/3, 1/3, 1/6 accelerated capital cost allowance are subtracted from the initial capital cost. Overall, the treatment is somewhat more optimistic than that used for water/rail comparability in the previous section.

Costs and cash flows for this *Canadian Bulker Base Case* are illustrated in the two pages of tables below. It is noted that the vessel capital charge accounts for some 44% of total cost. It is and will remain 2.6 times the *crew wages* cost element throughout the life of the vessel (it will not fade as the vessel ages). With the inflation adjustment applied to the cost of capital rate, the capital charge must escalate 4% annually over the 25 year vessel life to provide the predicted 10% interest on 60% of the capital and 15% after tax on the 40% financed by equity.

```
     ONTARIO GLSL STUDY: SENSITIVITY TO VESSEL ORIGIN
               Domestic Bulker -- Base Case
   LAKE BULKER COST PER ANNUM FOR GRAIN/CANADIAN MILLS ROUTE
 (THUNDER BAY-QUEBEC-SEPT-ILES-HAMILTON-THUNDER BAY=13.0 VOYAGES)
                                  1987$ PER ANNUM
                              -----------------------
CAPITAL CHARGE                                          3196951.0
OPERATING COST                                          2397946.0
 .Crew Wages                          1211812.0
 .Repairs and Maintenance              464182.2
 .Stores and Supplies                  173821.4
 .Administration                       231103.5
 .Insurance                            317026.6
VOYAGE COST                                             1719322.0
 .Port Charges                         443616.7
  -harbour dues               10976.7
  -handling                  432640.0
 .Seaway Tolls                         775164.0
  -cargo                     629200.0
  -grt                        89284.0
  -lockage                    56680.0
 .Pilotage Fees                         82793.5
 .Bunker Fuel                          417747.5
            TOTAL                                       7314218.0

   LAKE BULKER COST PER VOYAGE FOR GRAIN/CANADIAN MILLS ROUTE
 (THUNDER BAY-QUEBEC-SEPT-ILES-HAMILTON-THUNDER BAY=19.0 DAYS)
                                  1987$ PER VOYAGE
                             -----------------------
CAPITAL CHARGE                                           245919.3

OPERATING COST                                           184457.4
 .Crew Wages                            93216.3
 .Repairs and Maintenance               35706.3
 .Stores and Supplies                   13370.9
 .Administration                        17777.2
 .Insurance                             24386.7
VOYAGE COST                                              132255.5
 .Port Charges                          34124.4
  -harbour dues                 844.4
  -handling                   33280.0
 .Seaway Tolls                          59628.0
  -cargo                      48400.0
  -grt                         6868.0
  -lockage                     4360.0
 .Pilotage Fees                          6368.7
 .Bunker Fuel                           32134.4
            TOTAL                                        562632.1
```

## Canadian Bulker Base Case
## SAILING DISTANCES AND TIMES - GRAIN/IRON ORE COST ALLOCATION

| PORT OF CALL | DISTANCE (statute miles) | TIME IN PORT AND SAILING GRAIN | IRON ORE |
|---|---|---|---|
| THUNDER BAY | | 1.71 day(s) | |
| steaming to QUEBEC | 1372 | 5.52 ' | |
| QUEBEC | | 1.61 ' | |
| steaming to SEPT-ILES | 331 | | 1.04 day( |
| SEPT-ILES | | | 1.25 ' |
| steaming to HAMILTON | 858 | | 3.34 ' |
| HAMILTON | | | 1.25 ' |
| steaming to THUNDER BAY | 905 | 3.26 ' | |
| TOTALS | 3466 miles | 12.12 days | 6.88 |
| PERCENTAGE OF TIME | | 64 % | 36 % |
| VESSEL COST ALLOCATION-1987 | | $360085 | $202548 |
| VESSEL COST PER TONNE -1987 (cargo capacity=27500t) | | $13.09 | $ 7.37 |

## LAKE BULKER ANNUAL COST DISTRIBUTION FOR GRAIN/CANADIAN MILLS ROUTE
(THUNDER BAY-QUEBEC-SEPT-ILES-HAMILTON-THUNDER BAY=13.0 VOYAGES)

| | 1987$ COST IN % | | |
|---|---|---|---|
| CAPITAL CHARGE | | | 43.7 |
| OPERATING COST | | | 32.8 |
| .Crew Wages | | 16.6 | |
| .Repairs and Maintenance | | 6.3 | |
| .Stores and Supplies | | 2.4 | |
| .Administration | | 3.2 | |
| .Insurance | | 4.3 | |
| VOYAGE COST | | | 23.5 |
| .Port Charges | | 6.1 | |
| -harbour dues | 0.2 | | |
| -handling | 5.9 | | |
| .Seaway Tolls | | 10.6 | |
| -cargo | 8.6 | | |
| -grt | 1.2 | | |
| -lockage | 0.8 | | |
| .Pilotage Fees | | 1.1 | |
| .Bunker Fuel | | 5.7 | |
| TOTAL | | | 100.0 |

The following (second) set of tables show equivalent figures and flows for a Seaway maximum sized Lake/Ocean bulker, hypothetically built in Korea at half the price of a Canadian built Lake bulker. Vessel parameters for the foreign built Lake/Ocean bulker are:

```
Vessel Dimensions and Performance Information for LAKE/OCEAN BULKER
-------------------------------------------------------------------
                Gross Registered Tonnage =  21500
                             Length (m.) = 222.50
                            Breadth (m.) = 23.00
                              Depth (m.) = 14.60
           Draught Loaded in Seaway (m.) =  7.92
            Draught Empty in Seaway (m.) =  6.00
                 Cargo Capacity (tonnes) = 24800
       Speed Empty in Open Water (knots) = 12.0
      Speed Loaded in Open Water (knots) = 11.5
Fuel Consumption Rate in Port (tons Marine Diesel/Day) = 2.75
Generator Fuel Consumption Rate in Navigation (tons
          of Marine Diesel Fuel/Day) =  2.75
Main Engine Fuel Consumption Rate in Navigation (tons
            of Main Engine Fuel/Day) = 21.50
                        Crew Complement = 22
                  Annual Operating Days = 360
```

The price and financial parameters used above are the same as those for the domestic built ship with four important exceptions.

> The price is assumed to be $17.5 million delivered. To this must be added a duty of 25% for a foreign built ship, for an approximate effective cost of $22 million.
>
> Instead of a normal debt cost of 10%, builder provided debt financing of 60% of capital cost is assumed at a rate of 6 $^1/_2$ %.
>
> In lieu of the special accelerated *capital cost allowance* for Canadian built vessels, a *diminishing balance* rate of 15% is assumed to apply.
>
> In addition to 260 days operation in the Lakes, 100 days of revenue service outside of the system is assumed.

Resulting cash flows are shown on the following two pages:

The next logical extension towards the *foreign shipping* or *cabotage* situation relates to payment of Canadian income tax. This is an aspect often advanced as an impediment to a Canadian flag merchant marine. The vessel costing model, run assuming a hypothetical tax rate of 5%, generated the output on the final page.

## ONTARIO GLSL STUDY: SENSITIVITY TO VESSEL ORIGIN
### Foreign Built Vessel ($17.5 million + 25% duty)
### LAKE/OCEAN BULKER COST PER ANNUM FOR GRAIN/CANADIAN MILLS ROUTE (THUNDER BAY-QUEBEC-SEPT-ILES-HAMILTON-THUNDER BAY=14.0 VOYAGES)

| | 1987$ PER ANNUM | | |
|---|---|---|---|
| CAPITAL CHARGE | | | 1190562.0 |
| OPERATING COST | | | 2321424.0 |
| .Crew Wages | | 1133414.0 | |
| .Repairs and Maintenance | | 504467.6 | |
| .Stores and Supplies | | 191450.2 | |
| .Administration | | 182714.8 | |
| .Insurance | | 309377.6 | |
| VOYAGE COST | | | 1840022.0 |
| .Port Charges | | 478501.8 | |
| -harbour dues | 12581.8 | | |
| -handling | 465920.0 | | |
| .Seaway Tolls | | 774452.0 | |
| -cargo | 611072.0 | | |
| -grt | 102340.0 | | |
| -lockage | 61040.0 | | |
| .Pilotage Fees | | 93101.7 | |
| .Bunker Fuel | | 493966.5 | |
| TOTAL | | | 5352009.0 |

### LAKE/OCEAN BULKER COST PER VOYAGE FOR GRAIN/CANADIAN MILLS ROUTE (THUNDER BAY-QUEBEC-SEPT-ILES-HAMILTON-THUNDER BAY=18.0 DAYS)

| | 1987$ PER VOYAGE | | |
|---|---|---|---|
| CAPITAL CHARGE | | | 85040.2 |
| OPERATING COST | | | 165816.0 |
| .Crew Wages | | 80958.2 | |
| .Repairs and Maintenance | | 36033.4 | |
| .Stores and Supplies | | 13675.0 | |
| .Administration | | 13051.1 | |
| .Insurance | | 22098.4 | |
| VOYAGE COST | | | 131430.2 |
| .Port Charges | | 34178.7 | |
| -harbour dues | 898.7 | | |
| -handling | 33280.0 | | |
| .Seaway Tolls | | 55318.0 | |
| -cargo | 43648.0 | | |
| -grt | 7310.0 | | |
| -lockage | 4360.0 | | |
| .Pilotage Fees | | 6650.1 | |
| .Bunker Fuel | | 35283.3 | |
| TOTAL | | | 382286.4 |

### Foreign Built Lake/Ocean Bulker ($17.5 million + 25% duty)
### SAILING DISTANCES AND TIMES - GRAIN/IRON ORE COST ALLOCATION

| PORT OF CALL | DISTANCE (statute miles) | TIME IN PORT AND SAILING GRAIN | IRON ORE |
|---|---|---|---|
| THUNDER BAY | | 1.64 day(s) | |
| steaming to QUEBEC | 1372 | 5.17 ' | |
| QUEBEC | | 1.54 ' | |
| steaming to SEPT-ILES | 331 | | 1.00 day(s) |
| SEPT-ILES | | | 1.21 ' |
| steaming to HAMILTON | 858 | | 3.14 ' |
| HAMILTON | | | 1.15 ' |
| steaming to THUNDER BAY | 905 | 3.15 ' | |
| TOTALS | 3466 miles | 11.50 days | 6.50 |
| PERCENTAGE OF TIME | | 64 % | 36 % |
| VESSEL COST ALLOCATION-1987 | | $244663 | $137623 |
| VESSEL COST PER TONNE -1987 (cargo capacity=24800t) | | $ 9.87 | $ 5.55 |

### LAKE/OCEAN BULKER ANNUAL COST DISTRIBUTION FOR GRAIN/CANADIAN MILLS ROUT
### (THUNDER BAY-QUEBEC-SEPT-ILES-HAMILTON-THUNDER BAY=14.0 VOYAGES)

| | 1987$ COST IN % | | |
|---|---|---|---|
| CAPITAL CHARGE | | | 22.2 |
| OPERATING COST | | | 43.4 |
| .Crew Wages | | 21.2 | |
| .Repairs and Maintenance | | 9.4 | |
| .Stores and Supplies | | 3.6 | |
| .Administration | | 3.4 | |
| .Insurance | | 5.8 | |
| VOYAGE COST | | | 34.4 |
| .Port Charges | | 8.9 | |
| -harbour dues | 0.2 | | |
| -handling | 8.7 | | |
| .Seaway Tolls | | 14.5 | |
| -cargo | 11.4 | | |
| -grt | 1.9 | | |
| -lockage | 1.1 | | |
| .Pilotage Fees | | 1.7 | |
| .Bunker Fuel | | 9.2 | |
| TOTAL | | | 100.0 |

## Foreign Built Lake/Ocean Bulker with Carrier Income Tax Rate of 5%
## SAILING DISTANCES AND TIMES - GRAIN/IRON ORE COST ALLOCATION

| PORT OF CALL | DISTANCE (statute miles) | TIME IN PORT AND SAILING GRAIN | IRON ORE |
|---|---|---|---|
| THUNDER BAY | | 1.64 day(s) | |
| steaming to QUEBEC | 1372 | 5.17 ' | |
| QUEBEC | | 1.54 ' | |
| steaming to SEPT-ILES | 331 | | 1.00 day(s |
| SEPT-ILES | | | 1.21 ' |
| steaming to HAMILTON | 858 | | 3.14 ' |
| HAMILTON | | | 1.15 ' |
| steaming to THUNDER BAY | 905 | 3.15 ' | |
| TOTALS | 3466 miles | 11.50 days | 6.50 |
| PERCENTAGE OF TIME | | 64 % | 36 % |
| VESSEL COST ALLOCATION-1987 | | $233323 | $131244 |
| VESSEL COST PER TONNE -1987 (cargo capacity=24800t) | | $ 9.41 | $ 5.29 |

## LAKE/OCEAN BULKER ANNUAL COST DISTRIBUTION FOR GRAIN/CANADIAN MILLS ROUT
## (THUNDER BAY-QUEBEC-SEPT-ILES-HAMILTON-THUNDER BAY=14.0 VOYAGES)

| | 1987$ COST IN % | | |
|---|---|---|---|
| CAPITAL CHARGE | | | 18.5 |
| OPERATING COST | | | 45.5 |
| .Crew Wages | | 22.2 | |
| .Repairs and Maintenance | | 9.9 | |
| .Stores and Supplies | | 3.8 | |
| .Administration | | 3.6 | |
| .Insurance | | 6.1 | |
| VOYAGE COST | | | 36.1 |
| .Port Charges | | 9.4 | |
| -harbour dues | 0.2 | | |
| -handling | 9.1 | | |
| .Seaway Tolls | | 15.2 | |
| -cargo | 12.0 | | |
| -grt | 2.0 | | |
| -lockage | 1.2 | | |
| .Pilotage Fees | | 1.8 | |
| .Bunker Fuel | | 9.7 | |
| TOTAL | | | 100.0 |

# APPENDIX E

## Data Used for Unit Cost Sensitivity

```
GREAT LAKES/ST. LAWRENCE SEAWAY VESSEL COSTING MODEL
MODIFIED R.W. LAKE. RESEARCH AND TRAFFIC GROUP; AUGUST 1989

     Port Data for the GRAIN/U.S. MILLS Route
-------------------------------------------------------------------
     Grain Loading Port of THUNDER BAY
          harbour dues ($/grt) = 0.0000
          waiting time (days)  = 0.95
          loading rate (tonnes
                        /hr.) = 1500
     Grain Unloading Port of QUEBEC
          harbour dues ($/grt) = 0.0209
          waiting time (days)  = 0.85
          unloading rate
                 (tonnes/hr.)  = 1500
     Iron Ore Loading Port of SEPT-ILES
          harbour dues ($/grt) = 0.0209
          waiting time (days)  = 0.90
          loading rate (tonnes
                        /hr.) = 3300
     Iron ore unloading port of CLEVELAND
          harbour dues ($/grt) = 0.0000
          waiting time (days)  = 0.15
                    unloading rate
                  (tonnes/hr.)  = 3400


      Seaway Tolls:
                           GRT Toll on Welland         = $0.09/grt
                           Grain Cargo Toll on Welland = $0.39/grt
                             Ore Cargo Toll on Welland = $0.39/tonne
       Lockage Toll on Welland for Loaded Vessel = $315.0/lock
       Lockage Toll on Welland for Empty Vessel  = $230.0/lock
                                     GRT Toll on MLO = $0.08/grt
                              Grain Cargo Toll on MLO = $0.52/tonne
                                 Ore Cargo Toll on MLO = $0.85/tonne

      Transit Times for St. Lawrence Seaway
                          Welland Transit Time = 0.50 day
                          MLO Transit Time     = 1.00 day

 Handling Costs (berthage, stevedoring, agency, overtime,tug):
                                    Handling Cost = $33280/VOYAGE
```

```
1987 FUEL Price Data
--------------------
Marine Diesel ($/ton) = 150.00
Main Engine Fuel '    = 100.00
```

```
Vessel Dimensions and Performance Information for LAKE BULKER
------------------------------------------------------------------
                Gross Registered Tonnage =  20200
                              Length (m.) = 222.50
                             Breadth (m.) = 23.00
                               Depth (m.) = 12.80
            Draught Loaded in Seaway (m.) =  7.92
             Draught Empty in Seaway (m.) =  6.00
                 Cargo Capacity (tonnes) = 27500
      Speed Empty in Open Water (knots) = 11.5
     Speed Loaded in Open Water (knots) = 10.5
Fuel Consumption Rate in Port (tons Marine Diesel/Day) = 2.10
Generator Fuel Consumption Rate in Navigation (tons
          of Marine Diesel Fuel/Day) =  5.43
Main Engine Fuel Consumption Rate in Navigation (tons
            of Main Engine Fuel/Day) = 14.86
                      Crew Complement = 24
                Annual Operating Days = 260
Vessel Utilization in Revenue Service = 90%

         Newbuilding Price and Financial Information
         --------------------------------------------

                Newbuilding Price = $35000000
 This price is representative of recently built Great Lake ships (1987)
               Debt/Equity Financing = 0.60/0.40
                         Cost of Debt = 10.0 % per annum
              Average Cost of Equity = 15.0 % per annum
                 Equity Risk Premium =  0.0 % per annum
             Marginal Cost of Equity = 15.0 % per annum
                  Corporate Tax Rate = 50.0 % per annum
 Inflation Adjustment for Real Rate =  4.0 % per annum
 Weighted Cost of Capital after Tax =  8.7 % per annum
             Capital Cost Allowance = 1/6,1/3,1/3,1/6
                       Economic Life = 25 YEARS

              Annual Operating Cost (1987 $)
  -------------------------------------------------------------

                      Crew Wages = $ 1276080

       Repairs and Maintenance =     488800

           Stores and Supplies =     183040

                Administration =     243360

                     Insurance =     333840
                                  ---------
         Total  Operating Cost = $ 2525120
```

## LAKE BULKER COST PER ANNUM FOR GRAIN/U.S. MILLS ROUTE
## (THUNDER BAY-QUEBEC-SEPT-ILES-CLEVELAND-THUNDER BAY=14.0 VOYAGES)

| | 1987$ PER ANNUM | | |
|---|---|---|---|
| CAPITAL CHARGE | | | 4012177 |
| OPERATING COST | | | 2468666 |
| .Crew Wages | | 1247551 | |
| .Repairs and Maintenance | | 477872 | |
| .Stores and Supplies | | 178948 | |
| .Administration | | 237919 | |
| .Insurance | | 326376 | |
| VOYAGE COST | | | 2005414 |
| .Port Charges | | 477741 | |
| -harbour dues | 11821 | | |
| -handling | 465920 | | |
| .Seaway Tolls | | 994462 | |
| -cargo | 827750 | | |
| -grt | 96152 | | |
| -lockage | 70560 | | |
| .Pilotage Fees | | 89162 | |
| .Bunker Fuel | | 444049 | |
| TOTAL | | | 8486257 |

## LAKE BULKER COST PER VOYAGE FOR GRAIN/U.S. MILLS ROUTE
## (THUNDER BAY-QUEBEC-SEPT-ILES-CLEVELAND-THUNDER BAY=18.2 DAYS)

| | 1987$ PER VOYAGE | | |
|---|---|---|---|
| CAPITAL CHARGE | | | 286584 |
| OPERATING COST | | | 176333 |
| .Crew Wages | | 89111 | |
| .Repairs and Maintenance | | 34134 | |
| .Stores and Supplies | | 12782 | |
| .Administration | | 16994 | |
| .Insurance | | 23313 | |
| VOYAGE COST | | | 143244 |
| .Port Charges | | 34124 | |
| -harbour dues | 844 | | |
| -handling | 33280 | | |
| .Seaway Tolls | | 71033 | |
| -cargo | 59125 | | |
| -grt | 6868 | | |
| -lockage | 5040 | | |
| .Pilotage Fees | | 6369 | |
| .Bunker Fuel | | 31718 | |
| TOTAL | | | 606161 |

LAKE BULKER ANNUAL COST DISTRIBUTION FOR GRAIN/U.S. MILLS ROUTE
(THUNDER BAY-QUEBEC-SEPT-ILES-CLEVELAND-THUNDER BAY=14.0 VOYAGES)

| | 1987$ COST IN % | | |
|---|---|---|---|
| CAPITAL CHARGE | | | 47 |
| OPERATING COST | | | 29 |
| .Crew Wages | | 15 | |
| .Repairs and Maintenance | | 6 | |
| .Stores and Supplies | | 2 | |
| .Administration | | 3 | |
| .Insurance | | 4 | |
| VOYAGE COST | | | 24 |
| .Port Charges | | 6 | |
| -harbour dues | 0 | | |
| -handling | 5 | | |
| .Seaway Tolls | | 12 | |
| -cargo | 10 | | |
| -grt | 1 | | |
| -lockage | 1 | | |
| .Pilotage Fees | | 1 | |
| .Bunker Fuel | | 5 | |
| TOTAL | | | 100 |

SAILING DISTANCES AND TIMES - GRAIN/IRON ORE COST ALLOCATION

| PORT OF CALL | DISTANCE (statute miles) | TIME IN PORT AND SAILING GRAIN | IRON ORE |
|---|---|---|---|
| THUNDER BAY | | 1.71 day(s) | |
| steaming to QUEBEC | 1372 | 5.52 ' | |
| QUEBEC | | 1.61 ' | |
| steaming to SEPT-ILES | 331 | | 1.04 day(s) |
| SEPT-ILES | | | 1.25 ' |
| steaming to CLEVELAND | 1015 | | 4.29 ' |
| CLEVELAND | | | 0.49 ' |
| steaming to THUNDER BAY | 711 | 2.24 ' | |
| TOTALS | 3429 miles | 11.09 days | 7.07 |
| PERCENTAGE OF TIME | | 61 % | 39 % |
| VESSEL COST ALLOCATION-1987 | | $369758 | $236403 |
| VESSEL COST PER TONNE -1987 (cargo capacity=27500t) | | $13.45 | $ 8.60 |

# APPENDIX F

## Cross Lake Service

## University of Pennsylvania Study

The University of Pennsylvania and Gannon University[100] recently studied cross lake RoRo service on Lake Erie with Erie, Pennsylvania being the U.S. terminus and four ports in Ontario considered for the Canadian terminus. Port Maitland was selected as the port of preference over Port Dover, Nanticoke and Port Colborne. Port Stanley was not considered. The study team investigated the feasibility of an operation based on several sites at Erie and on various scales of operation. Initially, the study included combination rail and trailer service, but discarded rail as being less attractive than a dedicated trailer service.

The operation was tested with the assumption of a 32 week season, 7 days per week with load to unload taking 7 hours,[101] and therefore three crossings daily (1 1/2 round trips). In total there would be 672 crossings per season. Two ferry sizes were considered, a 40 trailer ferry and a 260 trailer ferry. Trucking costs were estimated at US$1.00 per mile (85 to 90 cents would be more realistic) with an average trip around the lake being about 150 miles. Accordingly, the study team estimated the maximum ferry toll would be $150 per trailer. [In order to be conservative, we have also calculated the economics of such an operation using a toll of US$100 per trailer.] The table below

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[100] various, Feasibility Study of a Commercial Traffic Ferry Service Between the Port of Erie and Various Ports of Ontario, Canada, Part I - Case Statement, Part II - Report, Part III - Critique, University of Pennsylvania and Gannon University, April 1989.

[101] The 7 hours are accounted for as follows:

| | | |
|---|---|---|
| 1. | Load Ferry 1.0 hour | |
| 2. | Clear Harbour | 0.5 |
| 3. | Lake Crossing | 4.0 |
| 4. | Enter Harbour | 0.5 |
| 5. | Unload Ferry | 1.0 |

provides a rough order of magnitude estimate of the economics of such an operation. It should be noted that terminal costs and vessel operating costs are taken directly from the study while vessel capital costs are taken from the study but calculations based thereon were made by the Research and Traffic Group using the same interest rate as the study team used for terminal capital costs.

**Cross Lake Ro-Ro Erie, Pa. to Port Maitland, Ont.**

Minimum

Maximum

Operation

Operation

| | $US | $US |
|---|---|---|
| Capital Cost - USA | 3,305,000 | 5,000,000 |
| Shore Based Facilities Canada | 275,000 | 1,430,000 |
| | 3,580,000 | 6,430,000 |
| Annual Payments @ 9% | $ 392,000 | $704,000 |
| Cost per crossing | $ 580 | $ 1,050 |

Vessel Operating Costs Per Crossing

| | | |
|---|---|---|
| Crew | $ 565 | 1,010 |
| Fuel | $ 1,175 | 3,590 |
| Supplies | $ 50 | 100 |
| Shore Support | $ 535 | 1,070 |
| Total | $ 2,325 | 5,770 |

| Vessel Capital Costs (US$ Million) | $1 | $3 | $6 | $10 | $20 |
|---|---|---|---|---|---|
| Annual Payment @ 9% ($'000) | 110 | 329 | 657 | 1,095 | 2,191 |
| Cost per crossing ($) | 163 | 489 | 978 | 1,630 | 3,260 |

Therefore the total cost per crossing would be:

| | Minimum Operation<br>$US | Maximum Operation<br>$US |
|---|---|---|
| Facilities Capital | 580 | 1,050 |
| Vessel Operations | 2,325 | 5,770 |
| Vessel Capital[102] | 978 | 3,260 |
| Total | 3,883 | 10,080 |

| | | Minimum Operation | Maximum Operation |
|---|---|---|---|
| Trailers needed per crossing | (@ US$150) | 26 | 68 |
| to break even | (@ US$100) | 39 | 101 |

At US$150 per trailer both operations would have flexibility to recover costs over fluctuating load levels. However, at a toll of US$100, the minimum operation would require an unrealistic traffic level to break even. On the other hand, the maximum operation only need operate at about 40% of capacity to break even. Furthermore, assuming operations at 50% of capacity the minimum operation would require a per trailer charge of US$195.00 (more than the over the road avoidable cost) and US$78 for the maximum operation.

It should also be noted that the major impediment to a minimum trailer ferry operation is not vessel capital cost but vessel operations cost. Even if capital cost were reduced to one-half the above estimate, the minimum operation (at US$100) would still require a consist of 34 trailers for each crossing which is an 85% load factor.

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[102] The minimum operation (40 trailer capacity) was estimated to have a maximum vessel capital cost of US$6 million. Similarly, the maximum operation was assumed to have a vessel capital cost of US$20 million.

While there are similarities between the above estimate and that of Chapter 3, there are also major differences. The cost of shore based facilities, for example, varies from port to port and, in the study for Erie, Pa., from option to option. The Lake Erie ferry could make three crossings per day while an Oshawa-Olcott ferry could probably make four because of the shorter route between those ports. A tug and barge, while slower moving, could make six crossings with a tow of one barge and one barge loading/unloading at each side of the lake.

# APPENDIX G

## *Canadian Coast Guard*
## *Attribution to Central Region*

The Coast Guard is an arm of Transport Canada responsible for several important aspects of maritime activity, most notably navigation aids, icebreaking and marine search and rescue. Its responsibilities cover all areas of Canada where these services could be required. Accordingly, it is a large organization (combined with Marine Transport) accounting for 6,073 person years and almost $600 million in operating expenditures in 1987-88.[103]

This appendix is an analysis of Coast Guard expenditures, broken down into five main parts which parallel the respective sub-activities developed by Transport Canada for the annual *Estimates* process, and their attribution to Central region.

## Marine Navigation Systems

Marine navigation expenditures are reported in the following table. Looking at each of the *key result areas* indicated in the table, it is possible to attribute cost to regions based on identifiable workload within each of these areas.

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[103] Part III of the *Government of Canada Estimates* provides a reasonably detailed breakdown of these resources on a national basis, but very little regional or provincial information. It became necessary to find a way to estimate resource utilization on a regional basis. This was accomplished using statistics such as number of navigation aids as workload proxies, and pro-rating national expenditures accordingly. From the regional distribution of these statistics, national resource utilization was allocated to develop measures of regional costs.

**Canadian Coast Guard**
**Marine Navigation Expenditures**

| | Person Years | Operations and Maintenance<br>$'000 |
|---|---|---|
| Short Range Aids to Navigation | 2,205 | 131,581 |
| Long Range Aids to Navigation | 72 | 6,042 |
| Waterways Development, Maintenance and Protection | 189 | 33,906 |
| Vessel Traffic Services | 401 | 24,341 |
| Safety and Public Correspondence Communications | 549 | 35,117 |
| **TOTAL** | **3,416** | **230,987** |

Source: Part III of the Estimates, 1989-90.

*Short range aids to navigation* is comprised of 12,851 buoys, 264 major lighthouses, 197 beacons and 6209 land-based aids such as range lights. These are distributed and listed by region. Assuming that costs per unit for each are evenly distributed across the system, this would provide an estimated 29% of these aids in the Central Region.[104] A further measure of operations indicates that approximately 26% of fleet ship time available was in the Central Region. Accordingly, it is assumed that 25-30% of operating and maintenance costs and associated person years were attributable to the Central Region in 1987-88.

*Long range aids to navigation* is comprised of 72 radio beacons and 4 Loran 'C' stations. The latter stations are located on the east and west coasts. the radio beacons are located throughout all Coast Guard regions. Of the 100 radio beacons operating in 1987-88, 23 were in the Central Region. Accordingly, it is estimated that somewhat less than 23% of total long range costs were experienced in the Central Region. Also, only about 12% of maintenance hours were spent in the Central Region. It is therefore estimated that operations and maintenance costs were approximately 15% of the total for this *key result area.*

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[104] Central Region commences at the St Lambert Lock of the St Lawrence Seaway and includes everything west thereof in Ontario including some facilities in Hudson Bay and in Lake Winnipeg.

*Waterways Development, Maintenance and Protection* is comprised of dredging for existing and new channels, depth sounding, regulation and construction of marine works, and the removal of wrecked vessels. It is estimated that about 11% of the cost of this activity can be attributed to the Central Region. This corresponds roughly with DPW dredging charges.

*Vessel Traffic Services* provides information to and receives information from vessels. The centre at Sarnia covers the whole Central Region. It is estimated, based on the three major indicators (number of operating position hours, number of ship movements in VIS zone and number of VIS information centres) that the appropriate Central Region allocation of expenses was 5% in 1987-88.

*Safety and Public Correspondence Communications* is composed of staffed and remotely operated radio stations. Six out of 33 staffed and 26 out of 125 remote stations were in the Central Region in 1987-88. It is estimated that about 20% of the cost of this key activity area was experienced in the Central Region in 1987-88.

The table below provides estimated expenses for each of the components of the Marine Navigation sub-activity in 1987-88 attributable to the Great Lakes and St Lawrence. As discussed in more detail later, all of this expenditure is not attributable to commercial freight transportation activities, and a (very small) portion is attributable to Hudson Bay and Lake Winnipeg. Further, allocation among users will be attempted in a subsequent section.

### Canadian Coast Guard Expenditures
### Marine Navigation
### Attributable to Central Region

| | % of Total | Expenditure $ 000 | Person Years |
|---|---|---|---|
| Short Range Aids to Navigation | 28 | 36,843 | 617 |
| Long Range Aids to Navigation | 15 | 906 | 11 |
| Waterways Development, Maintenance and Protection | 11 | 3,730 | 21 |
| Vessel Traffic Services | 5 | 1,217 | 20 |
| Safety and Public Correspondence and Communications | 20 | 7,023 | 110 |
| **TOTAL** | | **49,719** | 779 |

## *Icebreaking and Arctic Operations*

This sub-activity is comprised of four *key elements*, of which only three apply within the Central Region and are of concern within the GLSLSS. These are; Route Assistance Through Ice Infested Waters, Ice Management and Support to Other Government Departments and Agencies.

*Route assistance through ice-infested waters* is the traditional ice-breaking assistance to enable navigation through ice. Much of this activity is related to keeping the St Lawrence River open to Montreal year around and to keeping fishing harbours open in the Newfoundland, Maritimes and Laurentian regions. It is also used for keeping ferry channels open year around. It is estimated that a maximum of 5% of this activity can be attributed to the Central Region.

*Ice management* is all performed in the Laurentian region as a means to control ice build-up. Much of this activity may be related to flood control rather than to navigation. There is no estimated cost within the Central region. *Eastern Arctic Sealift* does not apply in the Central region.

*Support to other Government Departments and Agencies* includes responding to requests by providing CCG vessels and/or helicopters. The Central Region accounted for less than 1% of ship time in 1987-88, and approximately 17% of helicopter time. This latter percent is in line with the proportion of requests received in that region. Since ship time is much more expensive than helicopter time, it is estimated that the Central Region share of this expense is only 8%.

In summary, the Central Region share of Icebreaking and Arctic Operations is estimated as follows:

**Coast Guard Expenditures**
**Icebreaking and Arctic**
**Attributable to Central Region**

| | % of Total | Expenditure $ 000 | Person Years |
|---|---|---|---|
| Route Assistance through Ice-infested Waters | 5 | 3,464 | 39 |
| Ice Management | - | - | - |
| Eastern Arctic Sealift | - | - | - |
| Support to Other Government Departments and Agencies | 8 | 829 | 11 |
| **TOTAL** | | **4,293** | **50** |

***Marine Regulatory***

The regulatory sub-activity covers the development and implementation of marine regulations and standards related to marine safety and protection of the environment. It has two key elements; Ship Safety, and Emergencies.

*Ship safety* is a key element, much of which relates to commercial vessels and fishing boats. There are 39,699 vessels registered in Canada, 6,500 of which are subject to statutory inspections. These data do not include the large quantity (almost 2 million) of pleasure craft in Canada. This key element also includes foreign vessels calling at Canadian ports that must be inspected. Approximately 5,000 seafarers are certified each year. It is estimated that about 10% of the expense is incurred in the Central Region.

*Emergencies* are handled on a cost recovery basis. The only expenses borne by the Coast Guard are salaries and equipment maintenance. The Central Region's share of these expenses is estimated at 10%.

The Central Region share of total operating and maintenance for Marine Regulatory is estimated as:

**Coast Guard Expenditures**
**Marine Regulatory**
**Attributable to Central Region**

| | % of Total | Expenditure $ 000 | Person Years |
|---|---|---|---|
| Ship Safety | 10 | 2,306 | 40 |
| Emergencies | 10 | 643 | 9 |
| **TOTAL** | | **2,949** | 49 |

### *Marine Search and Rescue*

Search and Rescue service is provided within the Canadian area of responsibility under International Maritime Organization agreements, and within Canadian waters of the Great Lakes/St. Lawrence System. Promotion of safety and minimization of damage to property is also fostered. There are three key elements within this sub-activity; Search and Rescue Operations, Search and Rescue Prevention, and Canadian Marine Rescue Auxiliary.

*Search and Rescue Operations* encompasses all areas of marine activity viz, commercial, fishing and recreational. Much of the activity is related to recreational boating where there are almost 2 million small craft. It is estimated that about 20% of the cost of this key element occurs in the Central Region.

*Search and Rescue Prevention* is directed at fishermen and pleasure boaters. Instruction is given and instructors trained to enable widespread training of fishermen and pleasure boaters, and to prevent the need for search and rescue. It is estimated that about 20% of the expense is incurred in the Central Region.

*Canadian Marine Rescue Auxiliary* is a voluntary organization that is compensated by the CCG for out of pocket costs such as fuel, insurance, training and travel. It is estimated that the Central Region accounts for about 10% of associated costs.

The Central Region's share of Search and Rescue costs incurred by the Coast Guard[105] would be:

**Canadian Coast Guard**
**Search and Rescue**
**Attributable to Central Region**

| | % of Total | Expenditure $ 000 | Person Years |
|---|---|---|---|
| Search and Rescue Operations | 20 | 12,000 | 173 |
| Search and Rescue Prevention | 20 | 624 | 10 |
| Canadian Marine Rescue Auxiliary | 10 | 160 | 2 |
| **TOTAL** | | **12,784** | 185 |

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[105] Search and Rescue costs incurred by other agencies, particularly the Department of National Defense, should really also be considered. Estimates, Part III indicates estimated federal government 1989-90 expenditures on Search and Rescue of $232,779 million. Of course, land and air distress origins are also included.

### *Public Harbours and Ports*

There are 576 public harbours and ports in Canada. These facilities are in place to provide for the efficient movement of goods and people, and to support national, regional and local economic and social objectives. There are nine Harbour Commissions which are essentially self-financing. The smaller harbours are not financially self-sufficient and are administered by Transport Canada.

*Public harbours and ports* are concentrated in the Atlantic and Pacific Regions with 57 of the 576 total being in the Central Region. Tonnage handled in Central region ports is about 31% of the total. For this item, in response to enquiry, Transport Canada Marine forecast dredging and port maintenance expenditures for 1989-90 within Central Region at $9.5 million.

### *Total Canadian Coast Guard Marine*

The total estimated operating and maintenance expense for the Coast Guard/Marine operation attributable to Central Region would be as follows:

**Canadian Coast Guard Expenditures**
**Prorationed to Central Region**

| | Expenditure $ 000 | Person Years |
|---|---|---|
| Marine Navigation Systems | 49,719 | 779 |
| Icebreaking and Arctic Operations | 4,293 | 50 |
| Marine Regulatory | 2,949 | 49 |
| Marine Search and Rescue | 12,784 | 185 |
| Public Harbours and Ports | 9,500 | * |
| **TOTAL** | **79,245** | 1,080 |

* not included in information from Transport Canada

In response to a request for information, in addition to the Ports and Harbours information incorporated above, Transport Canada Marine provided budgeted 1988-89 expenditure figures for Coast Guard Central Region of:

| | |
|---|---|
| Salaries and other operating costs | $51,162,000 |
| Capital Expenditures | 10,539,000 |

It is not clear whether these figures directly parallel the estimates above, particularly the extent to which attributable headquarters expenditures are included. Also, 1988-89 was a lower activity year than almost anyone would have predicted. The order of magnitude ($61,700,000 vs $79,200,000) is reasonable given the prorationing methodology used. For the purposes of the present study, the estimates are adjusted to the Transport Canada totals as follows:

### Canadian Coast Guard Expenditures Attributable to Central Region

| | Expenditure $ 000 |
|---|---|
| Marine Navigation Systems | 37,200 |
| Icebreaking and Arctic Operations | 3,200 |
| Marine Regulatory | 2,200 |
| Marine Search and Rescue | 9,600 |
| Public Harbours and Ports | 9,500 |
| **TOTAL** | **61,700** |